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Note.—Initialled abstracts are written by the following:—

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* General studies, see also individual crops.

Plant Breeding Abstracts.

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Part 1. Empire Section

STATISTICS 519

675 BARTLETT, M. S. 519.24:631.421
Some examples of statistical methods of research in agriculture and applied biology.
Suppl. J. Roy. Statist. Soc. 1937 : **4** : 137–83.
The author illustrates the use of statistical technique by means of a number of interesting examples drawn from experimental work, mainly agricultural. The points dealt with include partial confounding in experimental design, the use of covariance, sampling (a section which contains an important test for the homogeneity of a set of estimated variances), and the efficient detection of treatment effects. A new method of calculating a missing value is described. J. W.

BREEDING 575

676. BELL, G. D. H. 575:633
Crops and plant breeding.
J. Roy. Agric. Soc. 1937 : **98** : 195–245.
This article has already been reviewed (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 298).

677. 575:633(42.9)
JENKIN, T. J. 633.13:575(42.9)
The Welsh Plant Breeding Station.
J. Agric. Soc. Univ. Coll. Wales 1937 : **26** : 35–43.
A brief account of the breeding work of the station on grasses, clovers and oats.
In the oat-breeding work varieties are bred to suit different levels of productivity. Ceirch Llwyd Cwta (S 171) has been produced for the poor conditions served by the *strigosa* var. Ceirch Llwyd. Radnorshire Sprig, Black Bell III and other varieties are used as parents in breeding new varieties for medium land; the new strain S 175 is to be increased for the market. For very good land stiff straw is most important and the new variety S 84, which is very resistant to lodging, will soon be available commercially. White-grained winter oats bred at the station are proving popular in the border counties and newer strains are giving even better results in field trials.

678. RUSSELL, J. 575:633(54)
Report on the work of the Imperial Council of Agricultural Research in applying science to crop production in India.
Madras Agric. J. 1937 : **25** : 331–42.
In connexion with the plant breeding work, the present work in general is commended and the desirability of associating it with a first-class geneticist is urged; the need for more work on millets, pulses and oil seeds is mentioned.

679. ANANDA RAO, D. 575:633(54.8)
The place of botany in agriculture.
Madras Agric. J. 1937 : **25** : 295–300.
The theme is illustrated by examples of some of the achievements of plant breeding in Madras.

680. 575:633(68)

Plant breeder's quest for better crops.

Fmr's Wkly, Bloemfontein 1938 : **54** : 1276–77.

A popular account of the plant breeding work at Potchefstroom School of Agriculture. From the cross between maize and teosinte a fodder type of maize, called Teomaize, is being developed by back-crosses to maize. Numerous inbred lines have been combined to produce the synthetic white dent varieties Anveld and Potchefstroom Pearl. The selection of witchweed-resistant strains of kaffir-corn is being continued. Non-shattering soya beans and upright, eelworm-resistant cowpeas have been bred and work is also in progress on the breeding of Rhodes grass and hay sorghum.

GENETICS 575.1

681. DARLINGTON, C. D. 575.116.1:576.354.46:576.12

The biology of crossing over.

Nature, Lond. 1937 : **140** : 759–61.

A brief account of the author's theory of crossing over is given (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 319) and the part it plays in evolutionary processes is discussed.

By adding the average chiasma frequency per cell to the number of pairs of chromosomes a recombination index is obtained which is a measure of the average total number of independently segregating gene-blocks in the species. It appears that a low index has a positive selection value, though the necessity for at least one chiasma per pair of chromosomes for regular meiosis establishes a lower limit.

Crossing-over in dyscentric structural hybrids causes changes in genetic balance, such changes being an effective means of variation.

Suppression of crossing-over as a result of small structural changes leads to isolation of chromosomes or parts of chromosomes and instead of the normal unit of crossing-over, the gene, a new unit is established; any gene differences occurring within this segment are held together in more or less permanent combination. This special type of unit gives rise to three important types of discontinuity in Nature. The simplest is that by which two groups which remain interfertile diverge within a species, possible examples being found in *Avena fatua* and *Triticum Spelta*, each of which differs from its relatives essentially in a group of genes lying in a part of one chromosome. The second type is that by which the sex-determining chromosomes, X and Y, come to be distinguished. The third type is that which arises between chromosomes in establishing a permanent hybrid of the *Oenothera* type.

682. ASHBY, E. 575.125

Heterosis and the inheritance of quantitative characters.

Proc. Roy. Soc. 1937 : **123** : Ser. B : 431–40.

Discussing the polymeric-factor theory of quantitative inheritance, the author points out that the assumptions made to explain the symmetry of the F_2 distribution are unnecessary, for it is not proved that this distribution is in fact symmetrical. Assumptions made by Jones, in his theory of heterosis as due to dominant growth factors, for the same reason are also unnecessary. When these assumptions are dropped, the two theories are more compatible. The author recommends investigation into quantitative inheritance and heterosis from a developmental point of view and cites some data from unpublished work relating to heterosis in a cross between *Lycopersicum racemigerum* and *L. esculentum*, shewing a general absence of high metabolic rates from the hybrid after germination. The relative growth rate in terms of height, of weight of stems and of weight of leaves, the differential growth ratio between stem and leaf, the mean relative rate of leaf production and the mean assimilation rate were all of the same value as in the *L. racemigerum* parent, which had the higher values of the two parents. Heterosis can be attributed to the initially larger primordia in the F_1 embryos. Two possible genetical explanations are advanced: (i) that there is practically no variety in genes controlling growth rates among different inbred races or (ii) that genetic differences between races, affecting rates of development, are suppressed by the limiting influence of the environment. A third possibility is the non-Mendelian hypothesis of a stimulation of the egg by a "foreign" male gamete.

683. STERN, C. 575.172
Interaction between cell nucleus and cytoplasm.
Nature, Lond. 1937 : **140** : 770–71.

DARLINGTON, C. D.
Interaction between cell nucleus and cytoplasm.
Nature, Lond. 1937 : **140** : 932–33.

Dr Stern points out that in certain characters in *Delphinium, Zea Mays, Ustilago* and *Chlamydomonas* observable in single cells, it can be shewn that specific genes can interact with the cytoplasm during the resting stage of the nucleus.
Dr Darlington points out that this is implied by everyday cytological observations and gives instances from apomictic species and forms with irregular meiosis in illustration.

CYTOLOGY 576.3

684. GATES, R. R. 576.312.34
Double structure of chromosomes.
Nature, Lond. 1937 : **140** : 1013–14.

DARLINGTON, C. D.
Structure of chromosomes.
Nature, Lond. 1938 : **141** : 371–72.

Studies of the chromosomes of *Trillium sessile* in somatic mitoses shew, according to Gates, that the metaphase chromosome contains four chromonemata and the anaphase chromosome two, embedded in a matrix and coiled around each other. At the ends of the chromosome the two chromonemata converge and meet end to end, though this is not a constant feature. This discovery is held to invalidate hypotheses based on the singleness of anaphase chromosomes and a resting-stage split, such as Darlington's view of the relation between meiosis and mitosis.
In his reply Darlington quotes the results of some investigations by La Cour and himself on the effect of fixatives on the appearance of the anaphase chromosome in the same species. These indicate that the apparent doubleness is an artefact induced by the fixative and due to bubbles of different refractive index in the chromatid. Such artefacts are shewn clearly when a fixative containing a high proportion of acetic acid is used.

685. BARBER, H. N. 576.356.2:581.01
Delayed mitosis and chromatid fusion.
Nature, Lond. 1938 : **141** : p. 80.

At anaphase in the pollen tube mitosis of *Kniphofia* and *Paeonia* pollen grains that had been stored for periods up to seven weeks, chromatid bridges were found. There is evidence that these result from the union of the homologous ends of the two sister chromatids derived by division from one parent chromosome.

686. NEBEL, B. R. 576.356.5:581.04
Mechanism of polyploidy through colchicine.
Nature, Lond. 1937 : **140** : p. 1101.

Observations on staminal hairs of *Tradescantia reflexa, in vivo,* shew that whenever mitosis occurs under the influence of the drug anaphase is prevented, leading to the formation of tetraploid nuclei (Cf. also Absts. 768 and 772).

AGRICULTURE 63

687. FORSTER, H. C. 63.00.15
Agricultural research overseas. Some aspects of what scientists are thinking and doing.
J. Aust. Inst. Agric. Sci. 1937 : **3** : 194–202.

Includes a brief account of some of the cereal breeding work in the United States, work on wheat quality in England and new statistical methods of enquiry.

FIELD TESTS 631.421

688. COCHRAN, W. G. 631.421

A catalogue of uniformity trial data.

Suppl. J. Roy. Statist. Soc. 1937 : 4 : 233–53.

After a brief discussion of the value and uses of uniformity trials a catalogue is given of trials carried out with different crops, giving the size and shape of the smallest unit harvested, its approximate area, the approximate total area and, in the case of published data, the authors, title and source. For those which have not been published an indication is given of where the data are available.

689. GILBERT, S. M. 631.421:519.24:633.73

Planning field experiments on *Coffea arabica*.

Trop. Agriculture, Trin. 1938 : 15 : 16–18.

Uniformity trials were carried out in three localities for two seasons with Arabica coffee, 4 x 4 Latin Squares with plots of 20 trees being imposed. It was found that in each season the plot error was very great, usually of the order of 30 per cent, the difference required for significance being of the order of 50 per cent.

Combination of two seasons' yield, which allows for biennial bearing, reduces slightly the order of significance between means. The possible value of the method of covariance is mentioned.

WHEAT 633.11

690. 633.11:575(93.1)

Fourth Annual Report, Wheat Research Institute, Christchurch, New Zealand for the years 1933 to 1936.

Bull. Dep. Sci. Industr. Res. N.Z. 1937 : No. 56 : Pp. 48.

Includes an account of the wheat-breeding work.

The field technique is briefly described and also the genetical work, which includes studies on the number of red factors of any red-grained wheat used as parent, a cytogenetic study of a speltoid exhibiting a regularly distributed pattern of semi-sterility in the ear and interspecific and intergeneric (*Agropyrum*) crosses.

The chief objective of the wheat-breeding is to improve milling and baking quality while maintaining the yield and other agronomic characteristics of existing wheats.

A collection of wheats is maintained. From wheats imported from Spain and Portugal the new spring varieties Tainui and Taioroa have been selected and their performance is described (Cf. also "Plant Breeding Abstracts", Vol. VIII, Abst. 12). In baking quality both varieties are intermediate between Tuscan and Cross 7 and in the districts for which they are recommended they outyield Tuscan. Both are susceptible to lodging.

In the hydridization work the chief attention in recent years has been devoted to back-crosses, but in 1936 a start was made with compound crosses. A promising line with Marquis quality from the back-cross (Tuscan x Reward) x Tuscan was used extensively in crosses with different varieties and hybrids, the aim being to improve it in yield and resistance to lodging. The organization of tests is briefly described.

An account is given of the performance of Cross 7 (Cf. "Plant Breeding Abstracts", Vol. V, Absts. 861) and also of Cross 31, from the same cross (Tuscan x White Fife). Cross 31 is higher-yielding than Tuscan but has no better quality.

Certain F_6 and F_7 lines from (Tuscan x Marquis) x Tuscan have for three years yielded better than Tuscan, with a baking quality similar to that of Cross 7. The line from (Tuscan x Reward) x Tuscan mentioned above and some of its close relatives are to be extensively tested in various localities to find those for which they are most suitable in yield and quality.

The analytical yield trials (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 698) are continued with advanced breeding lines.

The farinograph has been found to possess definite advantages and is to replace the distensometer in the testing of breeding lines. The fermentation test is to be retained for the early stages while in the later stages, F_7 and onwards a compound baking test will be used.

No relation between grain colour and quality as measured by the fermentation test was found in F_3 families from the crosses Tuscan x Red Fife and Solid-straw Velvet x Red Fife.

For "rod-row" plots a method of sowing into a strip of crêpe paper has been evolved; the paper strip is twisted to hold the grains in position and is rolled into a convenient shape for storage. In addition to its manipulative advantages, it appears that this method gives a distribution of seed more closely approximating to that obtained by drilling than does hand sowing.

691. Macindoe, S. L. 633.11:575"793":581.143.26.03(94)
An Australian "winter" wheat.
J. Aust. Inst. Agric. Sci. 1937 : **3** : 219–24.

The possibility of increasing wheat yields in Australia by developing a winter wheat is discussed in relation to Lysenko's theory of phasic development and the advantages of a winter wheat are pointed out.

Discussing the parents to be used in breeding such a wheat, the author suggests that varieties related to the "Turkey" wheat group are more promising than English winter wheats. Rust-resistance will be a necessary feature of an Australian winter wheat.

In the breeding of a rust-resistant winter wheat for the North-Western slopes in progress at Glen Innes, N.S.W., Tenmarq has been crossed with Pusa 4 and Dundee and Minturki with Ford. Selection for winter habit in the early generations can be made by sowing in December or January; the spring segregates head during the (Australian) autumn.

692. Johnson, L. P. V. and McLennan, A. 633.11:575.127.5:633.289:578.08
633.11:581.162.32:578.08
Hybridization of *Triticum* and *Agropyron* III. Crossing technique.
Canad. J. Res. 1937 : **15** : Sec. C : 511–19.

The technique of crossing is discussed in detail. It has been found that the stigmas of emasculated wheat florets retain their receptivity for a week or more and that wheat and *Agropyron* pollen can be stored under room conditions, if well aerated, for a day or two without appreciable reduction in viability.

OATS 633.13

693. 633.13:575(42.9)
633.13 S.84
Jones, E. T. 633.13 S.175
Two new varieties of oats for spring sowing.
Leafl. Welsh Pl. Breed. Sta. 1938 : No. 4 : 5–18.

An account of the spring oat varieties S.84 and S.175 bred by the Welsh Plant Breeding Station.

S.84 was bred for resistance to lodging and is designed to serve the areas of Wales with a high level of productivity. Compared with the variety Record it shews more resistance to lodging, a slightly higher yield of straw and about the same yield of grain; it ripens at the same time as Record which has a slightly higher percentage of husk and somewhat larger grain. It was bred from a cross made in 1920 between Victory and Red Algerian.

S.175 has been bred for soils of medium cropping capacity, the aim being to select a strain giving high yields of total produce combined with earliness of maturity and stiffness of straw. Compared with Radnorshire Sprig, which is the only early-ripening variety now grown on soils of this type, it ripens at about the same time, gives equal yield of grain, slightly lower husk percentage and about 28 per cent more straw. It is highly resistant to lodging. It was bred from the cross Black Bell III x Victory.

MAIZE 633.15

694. L....., R. J. 633.15:575(67.62)
Maize improvement in Kenya.
E. Afr. Agric. J. 1937 : **3** : p. 191.

At Njoro work on the development of inbred lines for crossing is in progress and also at Kitale, where attention is given in particular to *Fusarium* diseases and to white blight (*Helminthosporium turcicum*). At both centres single and double crosses are being tested this season.

Lines resistant to white blight have been obtained at Kitale but resistance to *Fusarium* has not yet been demonstrated. The bottle method of pollination has proved satisfactory at both centres.
Growers are advised as to the lines on which selection for seed should be carried on and competitions are held annually.
The selection work on native maize in the central provinces has led to the development of a white, early, high yielding type known as Muratha. Attention is now being devoted to improving the disease resistance of this variety.

695. Powers, L. and
Clark, A. 633.15:576.354.46:576.1
Failure of chromosome pairing as evidence of secondary diploidy in *Zea mays*.
J. Genet. 1937 : **35** : 301–13.
In a study on chromosome pairing in inbred lines of maize (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 137) it was found that the variability of failure of pairing within plants was greater than was to be expected for the binomial distribution if the 10 pairs of chromosomes respond independently in respect of failure of pairing. The occurrence of different base numbers, 5, 7, 9, 10, 11, 12 and 13 in the Graminae, with the occurrence of different base numbers within certain genera, suggests the possibility that the haploid number of maize (10) is derived from a lower number. In this case the different pairs of chromosomes might not all respond independently to the factors determining success or failure in pairing.
Various hypotheses concerning the composition of the pairing units in maize were set up and tested by comparing the obtained variability and frequency distribution with the theoretical. It was found that the best fit was obtained with the hypothesis that there were 7 independent units, 5 of which are composed of 2 chromosomes each, the 6th of 6 chromosomes and the 7th of 4 chromosomes. This hypothesis does not assume that the 6 chromosomes of the 6th unit nor the 4 chromosomes of the 7th form multivalents, but merely that they respond together in regard to failure of pairing. Such behaviour might be expected if maize were a secondary diploid having arisen from a form or forms with 7 pairs of chromosomes.

RICE 633.18

696. 633.18:575(91)
Jagoe, R. B. 633.18.00.14(91)
Padi selection and varietal trials 1936-1937.
Malay. Agric. J. 1937 : **25** : 493–524.
A detailed account is given of the selection work and varietal trials during the year at 5 Experiment Stations and 45 Test Stations situated in twelve States and Settlements in the Malay Peninsula and Borneo.

697. Sethi, R. L.,
Sethi, B. L. and
Mehta, T. R. 633.18:575.11–181.12:581.46
Awnedness and its inheritance in rice.
Indian J. Agric. Sci. 1937 : **7** : 589–600.
The effect of sowing the same rice variety at different spacings on the development of awns was studied and it was found that closer spacing resulted in greater development of awns. The inheritance of awnedness was studied in a cross between an awnless variety (T29) and a variety (T30) with awns averaging 3–4 cm. in length on the upper part of the panicle (the spikelets on the lower part bearing much smaller awns). The F_1 had awns only on a few spikelets near the tip of the panicle, the awns not exceeding 2 cm. in length. In F_2 five classes were distinguished but difficulty was experienced in assigning certain plants to these classes. Stress was therefore laid on the behaviour of the F_3 progenies of the F_2 plants, and it is concluded that the length of awns is governed by three or more genes acting cumulatively. Similar results were obtained in another cross between T15 and T34.
The inheritance of purple awn colour was also studied. The presence of colour was observed to behave as a simple dominant to absence of colour. B. P. P.

698. GANGULI, P. M. 633.18:575.11"793"
Inheritance of the flowering character in rice.
Curr. Sci. 1937 : **6** : p. 280.

Crosses were made between summer (early), autumn (medium) and winter (late) rices. In three crosses between summer and autumn forms the F_1 was intermediate and the F_2 distribution was roughly normal, indicating multiple factor inheritance. Transgression occurred towards lateness only.

In a cross between an autumn and a winter rice the F_1 was intermediate and the F_2 had a wide range of variation, the distribution being bi-modal and indicating a ratio of 3 late : 1 early. Transgressive segregation occurred on both sides.

In two crosses between summer and winter rices the F_1 was intermediate and in F_2 transgression occurred towards lateness only.

It therefore appears that plants earlier than the summer types are not recovered.

699. RAMANUJAM, S. 633.18:575.127.2:576.354.4
Cytogenetical studies in the Oryzeae. III. Cytogenetical behaviour of an interspecific hybrid in *Oryza*.
J. Genet. 1937 : **35** : 223–58.

A hybrid was obtained from the cross *O. sativa* x *O. officinalis*, both parents and hybrid having 2n = 24 chromosomes. The hybrid was completely self-sterile but when exposed to pollination by *O. sativa* set a few seeds which produced triploid plants (2n = 36).

Meiosis in the F_1 hybrid was very irregular and there was little pairing of chromosomes. There was evidence that in certain cells, following complete failure of pairing the 24 univalents divided at both first and second divisions, giving rise ultimately to the diploid gametes which are to be inferred from the back-cross progeny. Restitution nuclei were rare.

In the triploid back-cross progeny, meiosis was again very irregular, in spite of the formation of $12_{II} + 12_{I}$. Restitution nuclei, failure of wall formation, suppression of the first division and other abnormalities were frequently encountered.

700. RAMANUJAM, S. 633.18:576.356.5
Cytogenetical studies in the Oryzeae. II. Cytological behaviour of an autotriploid in rice (*Oryza sativa*).
J. Genet. 1937 : **35** : 183–221.

The triploid (2n = 36) had three nucleoli in somatic telophase nuclei as compared with two in the diploid strain in which it arose and at somatic prophase had three chromosomes associated with the nucleolus. At meiosis twelve trivalents were sometimes found but the commonest arrangement was $10_{III} + 2_{II} + 2_{I}$. No autosyndesis was observed, nor any restitution nuclei. The course of meiosis was fairly regular, though in some cells there were indications of a suppression of the second division, which might account for the dyads and tryads found among the pollen tetrads. Another abnormality affected certain cells with twelve trivalents, the trivalents moving to one pole or the other without disjoining their chromosomes. In the midst of cells which had already undergone their second division three cells were found with 12 trivalents arranged on the equator; behaviour of this kind might lead to the formation of unreduced gametes. The plant was completely self-sterile, owing to the failure of the anthers to dehisce, but when exposed to pollination by diploids, 41,000 spikelets produced 150 fully developed and 50 undeveloped grains. The latter failed to germinate, while of the former 50 gave rise to mature plants. The progeny ranged in chromosome number from 24 to 30, diminishing in vigour as the chromosome number increased.

Meiosis was studied in 2n + 1, 2n + 2 and 2n + 3 individuals of the F_1. In the first two types it was substantially normal, the supernumerary chromosomes remaining unpaired in some cells and combining with their homologues to form trivalents in others. In the 2n + 3 plant as well as this type of association, 13 bivalents were found in one cell and a quadrivalent in others. Irregularities in the course of meiosis were noted, apparently associated with break-down of the spindle mechanism. Two cells were observed with homotypic metaphase plates carrying the full complement of 27 chromosomes.

HERBACEOUS FORAGE PLANTS 633.2

701. Jenkin, T. J. and
Thomas, P. T. 633.263:575.127.2
The breeding affinities and cytology of *Lolium* species.
J. Bot. Lond. 1938 : **76** : 10–12.

The authors distinguish six species of *Lolium*, *L. perenne* L., *L. italicum* A. Br., *L. rigidum* Gand., *L. loliaceum* Hand.-Maz., *L. remotum* Schrank. and *L. temulentum* L. Of the 15 possible hybrids between these types, 11 have been produced, the missing ones being *italicum* x *rigidum*, *italicum* x *loliaceum*, *italicum* x *remotum* and *rigidum* x *remotum*.

Brief notes on the hybrids are given regarding the dehiscence of the anthers, the proportion of good pollen, univalent formation and the occurrence of inversion bridges at meiosis. Some failure of conjugation was observed in all hybrids except *remotum* x *temulentum*. Inversion bridges were recorded in six hybrids.

All the parent species are diploid (2n = 14) but the hybrid *rigidum* x *loliaceum* was a triploid with 21 chromosomes. There is evidence that the *rigidum* parent contributed the extra set of chromosomes.

Where reciprocal hybrids were obtained no difference between them was noted.

LEGUMINOUS FORAGE PLANTS 633.3

702. Stevenson, T. M. and
White, W. J. 633.366:581.143.26:575.242
An annual sweet clover (*M. alba*) of the dwarf branching type.
Sci. Agric. 1937 : **18** : 210–15.

In a single plant progeny of Alpha 3, a dwarf, branching, biennial form of *Melilotus alba*, a single annual plant appeared. Crosses with biennial forms shewed that the annual habit is produced by a single dominant factor. It is believed that this new annual arose as a mutation. Crosses with the annual variety Hubam shewed that the new annual and Hubam possess the same dominant factor for the annual habit.

ROOTS AND TUBERS 633.4

703. 633.41(42)
Herman, C. 633.63(42)
Wild beets on the east coast.
Brit. Sug. Beet Rev. 1937 : **11** : 105–08.

A preliminary account of wild beets from the east coast of England, studied in Poland and also in their natural habitat. They were found to belong to *Beta maritima* L. and to differ distinctly from the form of the same species growing in the south of Europe. The distinction between the two species *B. maritima* and *B. vulgaris* is held to be valid.

From their external morphology the English wild beets could be divided into five types, of which the fifth comprises intermediate forms considered to arise by hybridization. The first two types (*a* and *b*) are relatively constant and they are possibly self-pollinating. Type (*a*) usually runs to seed in the first year, while type (*b*) rarely does so and shews great vigour when grown under cultivation. No annual types were found.

704. Calder, R. A. 633.42:581.162.32:575.127.2
Interpollination of *Brassicas*. Its significance in relation to seed-production.
N.Z. J. Agric. 1937 : **55** : 299–308.

All the possible reciprocal cross-pollinations were made between the following forms: rape (*B. napus* L.), turnip, white flesh (*B. rapa* L.), swede, yellow flesh (*B. napobrassica* Mill.), wild turnip (*B. campestris* L.) and marrow-stemmed kale (*B. oleracea* L.). Seed was obtained from all crosses except those involving marrow stemmed kale and the hybrid forms are described. It was found that natural cross-pollination occurred when rape, turnip and swede plants were grown in close association.

It is concluded that when seed of these forms is being produced, every effort should be made to avoid cross-pollination between them.

705. Mundkur, B. B., Pal, B. P. and Nath, P. 633.491–2.411.4–1.521.6
Relative susceptibility of some wild and cultivated potato varieties to an epidemic of late-blight at Simla in 1936.
Indian J. Agric. Sci. 1937 : **7** : 627–32.

An epidemic of late-blight at the Potato Breeding Substation, Simla, caused by *Phytophthora infestans*, enabled the relative susceptibility of a large number of wild and cultivated potato varieties and species to be determined under severe infection conditions.

The majority of the varieties of *Solanum tuberosum* were found to be highly susceptible; some, however, shewed moderate resistance, and, a very few, high resistance. Most of the varieties of *S. andigenum* proved to be highly stem-resistant and the tubers also appeared to possess a high degree of resistance. Among the wild species, *S. demissum*, *S. Antipoviczii* and *S. neoantipoviczii* were immune from the disease, *S. chacoense*, *S. Caldasii* and *S. Commersonii* shewed considerable stem and tuber resistance, while *S. Fendleri*, *S. Maglia*, *S. otites* and *S. leptostigma* were found to be highly susceptible.

It is pointed out that both in the cultivated and the wild species of potato there exist varieties possessing varying degrees of resistance and attention is drawn to the possibility of developing new varieties by hybridizing the present commercially desirable varieties with those that shew a high degree of resistance to late-blight. B. P. P.

FIBRES 633.5

706. Ramanatha Ayyar, V. 633.51 *G. herbaceum*(54)
***Herbaceum* cottons of India.**
Proc. Ass. Econ. Biol. Coimbatore 1937 (1936) : **4** : 80–89.

Evidence is given to support the belief that *G. herbaceum* is not a native of India. The present position of *herbaceum* cottons is discussed and the future outlook. It is considered that breeding with this species will have to be undertaken on a much wider basis than at present if it is to maintain its position in face of the severe competition now developing abroad.

707. Chen, Y. J. 633.51:575(51)
Some cotton problems in China.
Proc. Ass. Econ. Biol. Coimbatore 1937 (1936) : **4** : p. 78.

The earlier cotton breeding work in China is briefly reviewed, the chief feature being the acclimatization of American cottons. An important problem to-day is the breeding of drought-resistant varieties.

708. Lambert, A. R. 633.51:575(62.4)
New Sakel strains in the Anglo-Egyptian Sudan.
Emp. Cott. Gr. Rev. 1938 : **15** : 14–20.

An account of the breeding of the strains X 1530, X 1730 and Lecrem, all derivatives of Sakel. X 1530 and X 1730 are very similar to each other and are derived from the same single plant selection made in the 1923–24 season within a field crop of R. E. Massey's Sakel No. 186, selection being continued until the 1930 31 season when the two strains were bulked separately for propagation. Though commanding rather lower prices than main crop Sakel these strains are more profitable to the cultivator on account of their increased yield of seed cotton and high ginning out-turn. They are resistant to leaf curl and have a marked capacity for recovery after blackarm infection. X 1730A, a derivative of X 1730 is slightly superior to X 1530.

Lecrem is a leaf-curl-resistant strain derived from R. E. Massey's Domains Sakel and is interesting for the short time occupied in its development. Field selections for leaf curl resistance were made in the 1929-30 season and were tested in progeny rows the following season. Seeds from two of the resistant families were bulked as one lot and during its propagation in the following two years very rigorous roguing was practised for type and leaf-curl resistance and also for lint quality and high yield. In 1933 34 roguing was continued on a nucleus plot and since then bulk propagation has been carried on.

The author suggests that mixed strains derived from more than one parent might often give more satisfactory results to the cotton grower than pure strains and have the additional advantage that less time is needed to develop them.

709. HUTCHINSON, J. B. and GADKARI, P. D. 633.51:575.11:677.1
The genetics of lintlessness in Asiatic cottons.
J. Genet. 1937 : **35** : 161–75.

Four glabrous lintless and three hairy lintless strains were used in these studies. The Dharwar, Mollisoni and Nagpur glabrous lintless strains were shewn to represent independent mutations at the same locus. Punjab glabrous lintless, however, when crossed with the Dharwar and Mollisoni mutants gave a hairy linted F_1 and a segregation in F_2 of 9 hairy linted : 7 glabrous lintless. The recessive factor for glabrous lintless in the first three strains is now termed h_a (Cf. "Plant Breeding Abstracts", Vol. IV, Abst. 559) and the complementary factor in the Punjab strain h_b.

The recessive factors for hairy lintless in the 1027 A.L.F. and (1027 × Wagad) hairy lintless strains were shewn to occupy different loci from each other and from the two factors for glabrous lintless.

The Punjab hairy lintless form previously studied (Cf. "Plant Breeding Abstracts" loc. cit.) was further investigated and it was found that the homozygote, eight generations after the original heterozygous plant was discovered, was no longer lethal; the homozygote has naked seeds. The heterozygote, it is now stated, is short linted rather than lintless. The relationship of this mutation to the other two types of hairy lintless has not been tested by crossing with them. Since, however, the heterozygote is normal in the latter two types it is probable that an entirely different factor is involved. The symbols li_a, li_b and li_c are suggested for hairy lintless in 1027 A.L.F., 1027 × Wagad and Punjab hairy lintless respectively. The change from lethality to viability of the homozygote of Punjab hairy lintless is discussed in relation to Fisher's theory of the evolution of dominance.

No satisfactory evidence of linkage was found for any of these lintless factors. There was an association, which could not be ascribed to linkage, between Li_c and leaf shape in segregating families in which considerable mutation from narrow to broad leaf had occurred.

710. HANSFORD, C. G. and HOSKING, H. R. 633.51–2.3–1.521.6:575(67.61)
Recent research in Uganda on blackarm disease.
Emp. Cott. Gr. Rev. 1938 : **15** : 7–13.

Work on the selection of strains resistant to blackarm (*Bacterium malvacearum*) is in progress at Serere, the criterion of selection being high yield coupled with resistance. An index of infection termed Blackarm Intensity has been evolved, consisting of the mean number of lesions per pound of vegetable matter, thus allowing for the larger number of lesions carried by larger plants. Data are given on the performance of different strains.

711. FIKRY, M. A. 633.51:677.1(62)
Long staple cottons in Egypt. A survey of the present position and a proposal for the future.
Bull. Roy. Agric. Soc. Egypt Tech. Sect. 1937 : No. 33 : Pp. 13.

The decline in staple length, strength and fineness of Egyptian cotton since 1922 is demonstrated. One of the measures advocated to remedy the situation is the production of a satisfactory substitute for Sakel, possessing good lint, good yield and adaptability to growth in several localities in Lower Egypt.

712. NANDI, H. K. 633.523:576.356.4:576.356.5
Trisomic mutations in jute.
Nature, Lond. 1937 : **140** : 973–74.

A variant jute plant characterized by smaller and deeply serrate leaves was found to have 15 somatic chromosomes instead of the usual 14 and is therefore a trisomic. It differs in many other characters and is highly sterile.

When selfed or used as female parent the trisomic gives a higher proportion of trisomics in its progeny than when it is used as male parent with normal jute.
At meiosis $6_{II} - 1_{III}$ and $7_{II} - 1_{I}$ were observed. Secondary pairing was noticed, giving in normal diploid jute a maximum association of two groups of two bivalents and three single bivalents. It is suggested that the haploid number n = 7 is derived from the number n = 5.

713. Doughty, L. R. 633.526.2:575
Experimental breeding of fibre *Agaves* in East Africa. Part I—The materials and the methods of the breeder.
E. Afr. Agric. J. 1937 : **3** : 222–28.
Among the desirable characters of a fibre *Agave* are high yield, good quality fibre, hardiness, adaptability and ease and cheapness of cultivation. An important feature in connexion with the last-mentioned is the presence or absence of spines on the leaf margin.
A collection of 88 species and varieties is now growing at Amani, including 12 species belonging to the group *Rigidae* of *Euagave*, to which most of the fibre-producing species belong. The work of pollination is straightforward, although a scaffold has to be built and the inflorescence protected from visiting insects by mosquito netting. Plants shewing incomplete fertility are used as male parents. Pollen remains viable for at least a week.

SUGAR PLANTS 633.6

714. McIntosh, A. E. S. 633.61(72.97)
Report on a visit to St. Kitts and Antigua, June 1937.
Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1937 : No. 15 : Pp. 12.
The present varietal situation in St. Kitts and Antigua is discussed and varietal recommendations made. Suggested schemes for testing new seedlings received *via* the Plant Quarantine Station in Trinidad are outlined.

715. 633.61:575.127.5:633.174(95)
Sugarcane—sorghum hybrids in wild state.
Curr. Sci. 1937 : **6** : p. 235.
According to this brief note, wild, putative hybrids between sugarcane and sorghum have been reported from New Guinea. It is also mentioned that the sugarcane x sorghum hybrids at Coimbatore have segregated types similar to indigenous Indian canes.

716. Stevenson, G. C. 633.61:581.192:578.081
Investigations into the use of the Zeiss Hand Refractometer. (2) Further experiments on the use of the Zeiss Hand Refractometer in the early stages of sugar cane seedling selection.
Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1937 : No. 16 : 11–16.
Further experiments have confirmed the reliability of the Zeiss Hand Refractometer method (Cf. "Plant Breeding Abstracts", Vol. VII, Abstr. 437) and in view of its advantages it is to be used in future in routine selection trials in place of the sucrose in juice measurements used in previous years.

717. Stevenson, G. C. 633.61–2.3–1.521.6:575.11
Studies on gumming disease of sugar cane.
Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1937 : No. 16 : 1–9.
An account of further work on the same lines as that previously reported (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 375).
Studies on a further series of 20 varieties confirmed the value of absence of leaf infection as an indication of resistance. Among the susceptible varieties the degrees of leaf and systemic infection do not run parallel. Varieties with high leaf infection and low systemic infection are dangerous as sources of inoculum.
Data are given shewing the percentage of resistant seedlings obtained from various types of crosses. In crosses between noble varieties the average was 73 per cent, ranging from 27 per cent upwards in different crosses. Crosses involving *Saccharum spontaneum* and *S. Barberi* or their derivatives exhibit a very high percentage of resistant seedlings. Even in the fourth and fifth nobilizations of *S. spontaneum* resistance percentages of 96–100 were found.

718. 633.63:575.12:633.41(47)

A hybrid variety.

Brit. Sug. Beet Rev. 1938 : **11** : p. 148.

A brief note on a Russian variety produced from a cross between sugar and fodder beets. It is said to be easily harvested by machine, owing to the roundness of the roots.

STIMULANTS 633.7

719. 633.71:575

HENNING, L. J. 633.71.00.14(68)

Tobacco varieties. Experiments conducted at the Rustenburg Experiment Station.

Fmg S. Afr. 1937 : **12** : p. 461, 465.

The results of variety trials are briefly summarized. Breeding work includes hybridization of Amarello with White-Stem Orinoco and with other varieties of the Virginia group. The large-scale production of F_1 seed from the latter type of cross has been attempted.

720. CARPENTER, P. H. 633.72(54.1)

Indian Tea Association Scientific Department. Report by the Chief Scientific Officer on the work of the Department for the year 1934.

Calcutta 1935 : Pp. 165.

An experiment by the chemical branch is described, in which the quality of tea produced by 6 different varieties was compared. Reports were received from Indian and London tasters and the teas were analysed for tannin, caffeine and total solids.

The botanical branch has begun work on the identification of tea varieties, based on leaf characters and number of stamens per flower. The varietal and seasonal variations of the hairiness of the tea leaf are also being studied.

721. CARPENTER, P. H. 633.72:575

The application of science to modern tea culture.

Emp. J. Exp. Agric. 1938 : **6** : 1–10.

Inter alia the work on selection is briefly reviewed and it is suggested that the next big development in tea culture will be in this direction.

722. NORRIS, R. V. 633.72:575(54.8)

The work of the Tea Research Institute of Ceylon.

Tea Quart. 1937 : **10** : 141–55.

In connexion with the improvement of planting material the need for a classification of jats is mentioned, as a basis for selection work. In the selection work itself the problem of quality is likely to be a difficult one and it may be necessary to devise a technique for manufacturing tea from the leaves of a single bush. Correlations between quality and anatomical features would be useful if they could be discovered.

Work has already begun in Ceylon on methods of vegetative propagation for the reproduction of selected material.

723. 633.73:575(67·8)

Third Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi 1936.

Pamphl. Dep. Agric. Tanganyika 1937 : No. 19 : Pp. 90.

The work on selection has been continued and data are given on yields of fruit, bean dimensions and liquoring quality.

The work on vegetative propagation has shewn that soft-wood cuttings are better than hard-wood and budding better than grafting.

Crosses have been made between Kents, Bourbon and Blue Mountain. It was found possible to store pollen for eight days over calcium chloride.

A list of coffee species and varieties on the station is given.

AROMATIC PLANTS 633.8

724. Babu, C. N. 633.81:576.312.35:576.356.5
Cytological studies in *Cymbopogon* spp.
Proc. Ass. Econ. Biol. Coimbatore 1937 (1936) : **4** : 7–12.
The following diploid chromosome numbers are recorded: *C. polyneuros* 20, *C. caesius* 22, *C. flexuosus* 20, 40 and 39 in different varieties, *C. coloratus* 40, *C. Martinii* 40, *C. Nardus* 20 and *C. citratus* 60.
Meiosis was regular except in the *C. flexuosus* variety with 39 chromosomes, in which case a univalent appeared. Terminalization was complete at diakinesis. At first metaphase the distribution of bivalents on the plate agreed with the floating magnets of Kuwada in *C. polyneuros* and *C. caesius*, except when disturbed by secondary pairing. The secondary pairing observed in these two species indicated a primary base number five.

OIL PLANTS 633.85

725. Richharia, R. H. 633.853.74:575.127.5:581.331.23
***Martynia* pollen germination on the *Sesamum* stigma.**
Curr. Sci. 1937 : **6** : 222–23.
The germination of pollen of *Martynia diandra* Glox. on the stigma of *Sesamum indicum* indicates that it may be possible to produce the intergeneric hybrid.

726. Smith, E. H. G. and Toovey, F. W. 633.855.34:575(66.9)
Investigation and selection in the oil palm.
Trop. Agriculture, Trin. 1938 : **15** : 33–41.
The Nigerian oil palms are tentatively classified into four types, the ordinary, the mantled, in which the fruit is surrounded by a ring of sterile carpels, the green fruited and the mantled greenfruited. Each of these types is divided into thin-shelled and thick-shelled forms. The thick-shelled forms are subdivided into very thick-shell, thick-shell and intermediate thick-shell sub-forms and the thin shell forms into intermediate thin-shell, thin-shell, shell-less and kernel-less sub-forms.
Thick-shelled palms on self-fertilization segregate on an average 4·5 per cent of thin-shelled palms; thin-shelled palms on self-fertilization give an average of 43·4 per cent of thick-shelled palms; greenfruited palms on self-fertilisation give 32·2 per cent of non-greenfruited palms. The corresponding figures on open pollination are 7·5 per cent, 72 per cent and 54 per cent. No genetical analysis has yet been attempted but data are being accumulated for this purpose.
In the work on selection self-fertilized progenies of selected trees have been planted out, the majority of the material being derived from the Calabar plantations. More recently the basis of the selection work has been broadened and controlled pollinations are being carried out at Aba, in Owerri Province.
Isolated multiplication plots for the production of improved seed are being laid down.
Although the thin-shelled fruit produces more oil, it appears that thick-shelled forms have a 25 per cent higher yield of fruit per acre, though the effect of selection for yield has yet to be determined.
Data are given to shew the physical composition of the fruit of different types and forms.
The method of artificial pollination is briefly described.
Extensive data have been gathered on the growth and flowering of oil palms but have not yet been analysed.
Heated trays or germinators have been found greatly to increase the germination of seeds, in some cases up to 60 per cent in six months and on an average up to 25 per cent in that period.

FRUIT TREES 634

727. Houston, D. 634.13:575.247"793"
Mutation in a pear-tree. Single branch acquires early blossoming habit of potential utility.
Fmr's Wkly, Bloemfontein 1937 : **54** : p. 691.
One branch of a pear tree of the Winter Nelis variety at Stellenbosch was found to flower

when the rest of the tree was still dormant. Since the blooming period of this bud mutant coincides with that of the Keiffer (? Kieffer) variety, it may prove to be a valuable pollinator for the latter variety; the variety at present used for this purpose, Le Conte, is otherwise valueless.

CITRUS FRUITS 634.3

728. GREIGG, A. M. W. 634.32(93.1)
New Zealand-raised sweet oranges.
N.Z. J. Agric. 1937 : **55** : 225–29.

A Mr Lippiatt, of Otahuhu, has raised some seedlings from grapefruit grown on Aitutaki, Cook's Islands. One of the seedlings produced fruits resembling the New Zealand Poorman's "Orange" and another produced sweeter fruits which may be of value as sweeter grapefruits than those now grown in New Zealand.

PALMACEOUS AND OTHER FRUITS 634.6

729. NEWBERRY, P. E. 634.63:581.9
On some African species of the genus *Olea* and the original home of the cultivated olive-tree.
Proc. Linn. Soc. Lond. 1937 : **150** : 3–16.

Archaeological and botanical evidence is presented to shew that the region adjoining the Nile Delta on the west was the original home of olive culture and that the cultivated plant later spread from thence to Crete and other countries of the Mediterranean.

VEGETABLES 635

730. DRIVER, C. M. 635.64:575.125
The commercialization of hybrid vigour in the tomato.
N.Z. J. Agric. 1937 : **55** : 352–64.

The earlier studies (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 481) have been continued using the varieties Abundance, Burwood, Earliana, Early Long Keeper, Kondine, Marglobe and Market Favourite. Out of 29 crosses made, 27 gave an increase in total yield over both parents and 2 were intermediate, 17 were earlier than both parents, 11 intermediate and 1 later than both. The average increase in yield of all hybrids over the parents was 95 per cent. An important feature from the commercial point of view is that much of this increase was obtained in the earliest of the three periods of harvesting studied.

In general, it is remarked that crosses between varieties with dissimilar characteristics gave greater expression of hybrid vigour. In the data given on yield, differences between certain reciprocal crosses are given, but the statistical significance of such differences is not given.

It is considered that the use of F_1 hybrid seed is worthy of commercial application.

731. SUTTON, E. 635.656:576.356:576.354.46
Cytological studies of *Pisum* I. Structural hybridity in *P. humile*.
Ann. Bot., Lond. 1937 : **1** (N.S.) : 785–95.

A description is given of chromosome behaviour at the first metaphase and later stages in two sister plants of *Pisum humile*. One of these is heterozygous for two inversions, and an analysis made of chiasma formation in and proximal to the inverted segments shews that the formation of comparate and disparate pairs of chiasmata appears to be at random. The other plant is asynaptic owing to reduced chiasma formation and is also heterozygous for various structural changes. The abnormalities described arose spontaneously in a single inbred line. J. G. H.

Part II. Foreign.

STATISTICS 519

732. Baten, W. D. 519.24
A formula for reducing the computations necessary to find the variance of a set of averages.
J. Agric. Res. **1937 : 55** : 575–80.

The method consists in taking an arbitrary mean and using the deviations from it for computation. A formula for the variance of the averages is derived and its use illustrated by examples, a typical one being a field experiment in which each plot has three rows, the yield of a plot being considered to be the average of the three rows.

BREEDING 575

733. Buchinger, A. 575:633
Gegenwartsfragen auf dem Gebiete der Pflanzenzüchtung. **(Modern problems in the field of plant breeding).**
Mitt. öst. Land- u. Forstwirtschafts Ges. Wien **1935 : 21** : Nr. 26 : Pp. 8.

After surveying some of the factors which influence the aims of plant breeding, such as the struggle for national self-sufficiency, the author gives an account of some of the recent improvements in technique. The chief methods of breeding are then described and the problems and achievements of plant breeding illustrated by numerous examples.

734. 575:633
Sapehin, A. 575.1:576.312
(Chromosomes, segregation and hybrid vigour).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) **1936** : No. 12 : 69–77.

The evidence of a number of observers is adduced to prove that segregation takes place at tetrad formation. This, together with a number of other facts such as linkage phenomena, are shewn to be irreconcilable with Lysenko's view of inheritance. The genetical conception of the interaction of the gene and the environment to produce the character is shewn to be more exact than Lysenko gives credit for and the value in practical breeding work of genetical principles such as multiple factors, heterosis etc. is illustrated. It is pointed out that no variety is a pure line in the absolute sense and Lysenko's results are shewn to be susceptible of an orthodox genetical explanation. It is nevertheless admitted that much genetical work is too abstract and neglects the urgent practical problems of the plant and animal breeders.

735. Builin, D. 575:633(47)
(The work of the Breeding Division of the Bezenčuk Experiment Station).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) **1936** : No. 12 : 232–36.

Improved varieties suitable for the north include a rye resistant to drought and cold and of good baking quality; winter wheats resistant to drought and to standing snow and with improved yielding capacity; maize of satisfactory maturity, standing capacity and high insertion of cobs; three varieties of millet; a spring wheat from *T. vulgare* x *T. durum* crosses with 15–20 per cent better yield than the standard; other interspecific wheat hybrids are resistant to smut and several pure line selections have displayed considerable improvements in yield.
Many *Triticum* x *Agropyrum* hybrids have been made, including *T. vulgare* x *A. cristatum*. Soya bean varieties of improved yield and drought resistance and others of exceptional earliness and improved lucerne types have been produced, in addition to superior selections of a number of other crops.

736. 575:633(47)
DELAUNAY, L. 575.1
(Does "formal genetics" give anything of practical use for the production of new varieties).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 59–68.
The author points out that most of the crop varieties at present cultivated would not have existed were it not for genetical theory, especially the principle of pure lines, having become part of the normal breeding method. He admits that most if not all so-called pure line varieties are still mixed populations but maintains that this does not imply the uselessness of pure lines or the method of pure line selection. It is further pointed out that though the method of producing early segregates evolved by Lysenko is excellent, yet it does not remove the necessity of working with large hybrid populations when it is desired to combine earliness with other characters. Some of the methods evolved by breeders for curtailing this work as much as is practicable are outlined and several established genetical principles are explained for the benefit of critics who have overlooked them.

737. GUBKOV, V. 575:633(47)
(Trend and results of the work of the Marymsk Experiment Station).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1937 : No. 4 : 174–80.
Breeding of cereals and peas was begun at this Station in 1934, and variety trials were first organized in 1929. Some of the standard varieties recommended for various regions are mentioned. Similar work is now in progress with vegetables and fodder grasses. In many respects the new lines and hybrids are declared to be superior to foreign varieties. GDS-30 (derived from a Marquis x Vostočnosibirskaja cross) is now being multiplied and has surpassed all other varieties tested with it for quality.
An unawned barley and a very early and high yielding oat have been produced.
The question of seed raising for the northern regions is briefly mentioned and the work organized by the Station on the vernalization of cereals and the stimulation of seed by treatment with metallic salts is referred to.
The development of fruit culture is being promoted by the collection of promising varieties and by studies on increasing frost resistance by breeding and cultural measures.

738. JAKOVLEV, P. 575:633(47)
(On the theories of the "true" geneticists).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 47–58.
The author defends Michurin's and Lysenko's views on the alteration of the genotype by environmental influence, mainly on the grounds that these workers have produced more practical results than the followers of the accepted genetical theories. The collections of the Leningrad Institute of Plant Industry are said to have been useless from the point of view of practical breeding.

739. 575:633(47)
LJUBIMENKO, V. N. 633:575.1(47)
(Obligations of the moment as regards theoretical botany in relation to the problem of raising productivity).
Sovetskaja Botanika (Soviet Botany) 1937 : No. 1 : 10–29.
Yield could be raised by breeding and by agronomic measures. Important subjects for investigation are: the laws underlying gene changes and the possibility of inducing mutations in a desired direction; distant hybridization; dominance; sterility; the use of clones to hasten breeding operations; and finally inheritance of physiological and biochemical characteristics and their possible correlation with anatomical or morphological characters.

Among other tasks awaiting the botanist in the U.S.S.R. are the physiological diagnosis and classification of the native crop plants, and for this it is suggested that a method for mass physiological analysis should be evolved.
The lag between research in botanical theory and the needs of the U.S.S.R. as regards economic crops and plants are discussed.

740. VAVILOV, N. 575:633(47)
(Scientific methods in Soviet plant industry).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjasitva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 33–46.
The author defends the law of homologous variations on the grounds that it has led to the discovery of an immense number of new forms of cultivated plants. He further refers to the important role that local varieties have played in breeding work carried out under his direction, the value of many of the forms obtained in the expeditions abroad and the use of wide crossing, on the lines first indicated by Michurin, the most promising results of these crosses being cited.

741. 575:633(47)
635.656:575"793"
ŽEBRAK, A. 635.656–1.541.1
(Categories of genetics in the light of dialectical materialism).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 78–88.
The author quotes the works of Morgan and other geneticists to shew that the gene is not a fixed and "formal" concept but is admitted to be susceptible of alteration and therefore is not in conflict with the principle of dialectical materialism.
Original experiments are referred to in which the pea varieties American Wonder and Giant were intercrossed. The cross was made in 1934 and repeated in 1935 so that in 1936 both F_1 and F_2 seeds were available; these were sown together with the parent varieties. On 10th June the first flowers appeared and were on two plants of the F_2; on 13th June flowers appeared on one plant of the early parent American Wonder and on four more of the F_2; on 17th June three more plants of the early parent and 10 of the F_2 flowered. At the time when eight plants of American Wonder had come into flower there were 32 F_2 plants in flower. The early parent finished flowering on June 23rd and on this day four plants of the F_1 began flowering. On the 25th eight more F_1 plants flowered and others of the F_2. The Giant parent flowered only on the 27th, on which day 56 plants of F_2 and 15 of F_1 were in flower; Giant stopped flowering on 1st July, while the F_1 and F_2 were still continuing.
Similarly at maturity, 19 plants of F_2 were the first to ripen, being harvested on 15th July. On 25th July there were gathered three plants of American Wonder, 38 of F_2 and 16 of F_1. The F_1 was somewhat later still. The last F_2 plants were harvested on 17th August.
These results are in disagreement therefore with Lysenko's view of the inheritance of time of maturity.
In another experiment grafts were made of the pea variety Thomas Laxton with recessive wrinkled seeds on to Yellow Victoria and conversely; the flowers of Victoria grafted on to Laxton were pollinated with Laxton. No difference could be observed in the offspring. Similarly male plants of hemp were transplanted on to female plants and vice versa; no change in length of vegetative period occurred in either case, even in a piece of male stem grafted between upper and lower sections of a female plant. Any specific influence of the stock on the scion remains, the author considers, a matter of speculation.
The method of intravarietal crossing, though capable of a genetical explanation, must be judged only on its success or failure in practice.
The author is of the opinion that almost all phenotypical variations have an ultimate effect on the genotype and in this sense are hereditary, though the genetic variations produced do not necessarily correspond to the phenotypical differences and may in the first place be indetectable, only later, cumulatively, coming into evidence as mutations etc.

742. ŽUKOVSKII, P. 575:633(47)
(Reply to a critic and remarks on some truly controversial questions).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 153–60.
In reply to the article by Kol' (Cf. "Plant Breeding Abstracts," Vol. VII, Abst. 891) the author defends the plant collecting work of the Leningrad Institute of Plant Industry, though he declares that the later utilization of the material has been inadequate.
While agreeing with Michurin in the main, the author offers alternative explanations for some of his results.

743. 575:633(49.2)
633.0014(49.2)
Ondersteuning van den Kweekersarbeid. (**Support for the breeder's work**).
Erfelijkheid in Praktijk, Leiden 1937 : **2** : 38–39.

575:633(49.2)
BROEKEMA, C. 633–1.531.12(49.2)
Medeeling over Landbouwplantenveredeling. (**Note on agricultural plant improvement**).
Erfelijkheid in Praktijk, Leiden 1937 : **2** : 74–77.
The first paper deals with prospects opening up for Dutch growers of agricultural crops. The writer mentions the direct and indirect methods of promoting plant industry in Holland, including state aid in various forms.
Plant improvement is being promoted by official variety trials and the publication of lists of approved varieties, enabling the public to judge which are the best types and the most suitable environments for them. Services have also been established to determine whether seed or tubers obtained direct from the breeder and subsequently multiplied by individual growers have remained pure and true to the varietal type, as well as free from disease.
Prizes are also distributed to breeders of agricultural and horticultural plants and in 1937 it was decided to award annual premiums and small subsidies to the breeders of various crops and fruit that satisfy the conditions laid down by the Nederlandsche Algemeene Keuringsdienst, officially appointed to approve any new varieties or seed produced. Foreign growers are eligible for certain of these awards, provided a similar privilege in the foreigner's country is open to the Dutch breeder.
In the second paper further information is given on the various financial and other methods adopted to promote plant improvement in Holland, on the production of new varieties of apples and on methods of ensuring supplies of pure, high quality grass and clover seed.

744. VETULANI, T. 575:633(56)
Turecka Stacja Hodowli Roślin w Sazova. Wspomnienia z roku 1934. **(The Turkish Plant Breeding Station at Sazova. Reminiscences from the year 1934).**
Roczn. Nauk Rol. 1937 : **38** : 141–46.
In addition to the Sazova Plant Breeding Station there were in 1934 in Turkey also the following: Adapazary, working on potato and maize breeding; Ankara, working on the improvement of cereals, particularly *Triticum durum*; Yesil-köy, breeding cereals, legumes and forage plants; and the cotton breeding stations at Adana and Nazilli.
The Sazova station has developed greatly in recent years; 100,000 Turkish pounds were spent on building operations in 1931. The agricultural implements have also been improved.
Breeding work is confined to cereals and forage plants, one of the main objectives being winter forms of high drought resistance. New varieties of two-row barley and oats capable of withstanding temperatures of –27° C. have been bred, the oat being a form of *Avena abyssinica* with large elongated grains.
The best wheats produced are the following: No. 702 (*T. vulgare comp.* Ak Kermir 1 or Ak-Bugday), awned with white grain; No. 705 (*T. vulgare comp.*, Kyzyl Kernes) awned with white

grain, giving as much as 20 per cent more yield than 702, though possessed of certain defects such as weak straw and low protein content (10 per cent as opposed to 12 per cent in 702): No. 701 (*T. vulgare comp.*, Kyzyl Kermir) awned with white vitreous grain containing 15 per cent protein, in consideration of which it will replace *T. durum*, which is moreover insufficiently winter-hardy. For this reason breeding work has been started on *T. durum* too, though even for macaroni production No. 701 would seem to be superior. For bread making No. 702 is the best and most recommended to the peasants.

A further important problem is the production of a biennial wheat which, when sown in the spring will remain in the vegetative stage over the winter and come into ear only in the following year, which in many parts of Anatolia is the only way of getting a well established root system before the winter, since the autumn is excessively dry. It is realized that the problem is one of some complexity, since any biennial wheat would have to be also very resistant to drought and to rust. Only 117 plants remained in 1933 out of a collection of wheats from all over Turkey sown in the spring of 1932. These, therefore, being the only forms with any pretentions to a biennial habit, have been grown on for further study and in 1934 only three lines of any promise were retained.

In central Anatolia three species of wild beet occur, *Beta trigyna*, *B. intermedia* and *B. lomatogona*. The first grows in the vilayet Sivas as a weed in grain fields, 112 seeds being found in a kilogramme of wheat. By crossing it with Ukrainian sugar beet (both parents being thus drought-resistant) a triennial form of sugar beet has been produced. These when planted in spring grow in the normal manner and can be lifted for sugar in the autumn. If for any reason they are not lifted they will remain through the winter undamaged and continue to grow in the following year without flowering, so that in autumn they can be lifted in the usual way. If they remain in the ground, they flower and seed only in the third year. It is now being sown in August, so that in the following spring the plants are well rooted and more likely to withstand the spring pest *Cleonus punctiventris*; this also reduces the cost of seed production.

Breeding work is being carried out on safflower to increase the oil content of the seeds, and to produce spineless forms, which have now been obtained by mutation; on lucerne to produce from the common three-leaved form, a form with multiple leaves, forms with an average of 4–6 and up to 6 being observed in the moist year 1934; with *Salsola kali* (Russian thistle) to produce a spineless form for fodder, which has not yet been achieved. A start has been made in breeding vegetables and flowers, *Blitum capitatum* being included among the former.

745. Tschermak-Seysenegg, E. 575:633:062
Zum 25 jährigen Jubiläum der Gesellschaft für Pflanzenzüchtung. (**The 25 year anniversary of the Society for Plant Breeding**).
Wien. Landw. Ztg. 1937 : **87** : No. 25 : 195–97.
An account of the functions, activities and achievements of the Society, in theoretical and practical breeding. A. B.

746. Schwarze, P. 575:633:578.088.1
Chemisch-technologische Methoden für die Pflanzenzüchtung. (**Chemico-technical methods for plant-breeding**).
Forschungsdienst 1937 : **4** : 447–55.
The lecturer briefly reviews some of the most used methods for the estimation, both qualitative and quantitative, of various plant products, such as oils, fats, alkaloids, proteins, and fibres. Such methods are employed by the plant breeder in selecting the best plants for their appropriate purposes.

747. Ullrich, H. 575:633:581.1
Die Bedeutung physiologischer Methoden für die Pflanzenzüchtung. (**The importance of physiological methods for plant-breeding**).
Forschungsdienst 1937 : **4** : 307–14.
In this lecture the author points out the uses made by the plant breeders of physiological methods. These include the various methods of vegetative propagation for the production

of clones and the importance of auxins in this branch of work; the technique for inducing fertilization both in selfing and cross pollinations; the hastening of germination, the total yield of fodder plants; in breeding for resistance and in such special cases as the production of a coumarin-free strain of *Melilotus*.
Close co-operation between plant breeder and physiologist will lead to increased progress in breeding research.

GENETICS 575.1

748. 575.1
PIZA, S. DE TOLEDO (JR.) 576.312
A proposito do curso rapido de cytologia e genetica. (**Regarding the rapid course of cytology and genetics**).
Rev. Agric. S. Paulo 1937 : **12** : 451–52.
In making reference to a course by F. G. Brieger and E. A. Graner attention is called to the misuse of the expression "cytogenetics" and mispronunciation of certain cytological words in Portuguese.

749. BROEKEMA, C. 575.1:061(49.2)
De Genetische Vereeniging en haar taak. (**The Genetics Association and its function**).
Erfelijkheid in Praktijk, Leiden 1936 : **1** : 14–16.
This article deals with the history, organization, growth and development of the Association and the widening of its scope to include not only plant and animal genetics, but also the study of human inheritance and eugenics. Its functions are: to supply information on genetic research, to serve as a means of contact in Holland (and in other countries too) between scientific and other investigators, to stimulate interest and investigation, to organize meetings and exhibitions, to issue publications and to act, when necessary, in an advisory capacity, for which purpose an advisory bureau has been set up under Dr. Hagedoorn, the Secretary of the Association.
It is hoped that the journal issued by the Association may serve as propaganda leading to an increase in the membership of the Association.

750. DUFRENOY, J.,
GISQUET, P. and
VEZIAN, M. 575.1:633.71
Introduction à la génétique du tabac. (**Introduction to the genetics of tobacco**).
Mémor. Serv. Exploitation Industr. Tabacs. Allumetes 1937 : **1** : Sér. B : Pp. 155.
In the first part of this monograph the principles of the mendelian theory are expounded in some detail. There is also a brief mention of the cytological basis of the theory. Part II illustrates the statistical methods as applied to a verification of the mendelian theory. Most of the examples are taken from experiments with tobacco. The hope is expressed in a foreword that the work will provide a basis for the explanation of the various phenomena to be met with in tobacco breeding.

751. 575.14
PLAČEK, E. 633.854.78:575.14
(**Breeding cross-fertilized plants on the basis of inbreeding**).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 98–103.
The inadequacy of mass selection is pointed out and reference made to a number of improved lines of sunflower that have been produced by individual plant selection. These have proved fairly constant as regards the characters for which selection was made, though they have been shewn to be heterogeneous in respect of certain other characters and the author considers there is little risk of their being too homozygous. In fact it is thought desirable to go further

and apply inbreeding, which, it is mentioned, has been applied with success in hemp by Griško and in sunflowers by the author. Several promising lines obtained by this means are referred to, e.g. Inbred Family 137, selected for rust resistance, thin shell and high oil content, is being multiplied on a large scale and will replace No. 169; Inbred Family 140, superior in earliness and yield and somewhat rust resistant; the inbred variety Saratov Dwarf, possessed of unusual earliness. The method of crossing inbred lines as used so successfully with maize is now being applied to sunflowers.

752. Sizov, I. 575.14
(Inbreeding and its application to breeding).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 89–97.

Numbers of facts are enumerated in illustration of the failure of inbreeding of cross-fertilized plants to produce any variety of practical value, reference being made to a variety of different crops, in a number of different countries. The degenerate types that appear are regarded as the direct results of inbreeding and not recessive segregates. In support of this a case is quoted where two inbred lines of rye in the sixth generation, where they had ceased to give albinos, were intercrossed and gave a still larger number of albinos in the inbred progeny of the hybrid.

For practical purposes varieties with the maximum number of desirable characters and the minimum of defects are required and complete homozygosity is not thought necessary or indeed even desirable. A few cases where improvement has been attained through inbreeding are quoted.

753. 575.14
Vakar, B. 575.74
(Degeneration of varieties in connexion with self-pollination).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 113–27.

Lysenko's example of the progenies of two different plants of a variety earing at different times is referred to and shewn to be a proof of the impurity of the variety in respect of time of maturity but not necessarily of degeneration. Other cases used by Lysenko are also shewn to be invalid as proofs of degeneration in self-pollinated varieties and mention is made of a number of varieties whose cultivation is extending and in which no signs of degeneration, or indeed any alteration have been detected in the course of a great number of years, some of these are even hybrid varieties.

The statement that varieties of cross-fertilized plants are more constant than self-fertilized plant varieties is also shewn to be incorrect. The names remain the same but the varieties themselves are in a state of constant variation, being subjected to continuous artificial selection. Experiments are quoted in which Lysenko's method of emasculation used for intraracial crossing was tested; 123 spikelets on 20 ears were emasculated in this way, which consists of cutting off the spikelet tops with scissors. Ten of the ears were bagged and produced 106 grains, being about 2 grains per spikelet; the remaining 10 ears were left free and produced 64 grains. Self-pollination is therefore not excluded by the method, which moreover subjects the plant to greater risk of smut attack and contamination with other varieties. Many other objections to the method of intraracial crossing are presented.

754. Vinogradova, E. I. 575.148:575.42
(Repeated selection within a pure-line variety).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 4 : 21–22.

By selecting certain vigorous plants in a plot of the wheat variety Moskovskaja 02411 a new élite stock was produced which differed from the typical plants of the variety in the earlier stages by greater vigour of growth. It was later in maturity, even after vernalization, but gave 24·9 per cent more yield than the original variety, the grain being identical.

755. Levitsky, G. 575.17
(The question of the material basis of inheritance).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture 1936) : No. 12 : 151–52.
Several points in Lysenko's argument against genetical theory are shewn to be untenable.

756. Timoféeff-Ressovsky, N. W., Zimmer, K. G. and Delbrück, M. 575.17 575.243:358.531
Über die Natur der Genmutation und der Genstruktur. **(On the nature of gene mutations and of gene structure).**
Nachr. Ges. Wiss. Göttingen 1935 : **1** : (N.S.) : Ser. VI : 189–245.
The first part of this article reviews the *Drosophila* work on spontaneous and induced mutation. It is shewn that spontaneous mutations in general have a low frequency; that spontaneous mutability is independent of time, i.e. the probability that a gene will mutate is constant and does not increase with time; that the spontaneous mutation rate is to be defined as percentage of mutations per unit of time; that the spontaneous mutation rate depends on the temperature, following the van t'Hoff rule with a temperature quotient for 10° C. of about 5 and finally that different genes and even different allelomorphs of the same gene shew different mutation rates, indicating that mutability is in part influenced by the structure of the allelomorphs.
With regard to X-ray induced mutation the following points are made: the mutations are of the same type as occur spontaneously; they occur in both sexes and in all tissues as a result of direct action by the X-rays on the genes and not a purely destructive action, for in many cases back-mutation is observed; the mutation rate is directly and linearly proportional to the dosage, which is measured by its ionization capacity; there is no dependence on the wave-length or upon the length of time during which the dosage is applied or upon temperature, but impregnation with salts of heavy metals causes an increase in the mutation rate, probably due to better absorption of the radiation; the induced mutation rate of individual genes depends on the allelomorph concerned and the relative frequencies of direct and reverse mutations of different allelomorph pairs shew all transitions from cases in which both types are equally likely to those in which only one can be obtained; naturally labile genes have not necessarily a particularly high induced mutation rate and indeed mutable allelomorphs are the least affected by increase in temperature or by irradiation.
In the second part of the article the implications of the hit ("Treffer") theory of X-ray action are examined and it is shewn that one hit is sufficient to produce a mutation and that this hit consists in the production of a pair of ions.
In the third part a model of gene mutation based on atomic physics is described. The gene is conceived as a complicated but relatively stable molecule which directs but does not participate in the chemical processes of the cell. Mutation is then an alteration in structure of this molecule requiring extra energy. The extra energy may come from random variations in the temperature energy, as in spontaneous mutation, or from irradiation. The implications of this theory are examined and it is shewn that it explains the general parallelism between spontaneous and induced mutation and also certain features of both.
In the fourth and final part the material of the preceding parts is summed up and discussed. It is suggested incidentally that, by analogy with photo-chemistry, the use of monochromatic ultra-violet irradiation should make it possible to separate groups of mutations, in which connexion the more recent results of Stadler and his co-workers are of interest (Cf. Abst. 838). To sum up, the gene is represented as a combination of atoms, in which mutation can take place as atom-rearrangement or bond-dissociation, produced by variation of the temperature energy or by the introduction of energy from without.

757. Muller, H. J. 575.17:53
Physics in the attack on the fundamental problems of genetics.
Sci. Mon., N.Y. 1937 : **44** : 210–14.
The author appeals to physicists to investigate the properties of genes, in particular their properties of specific attraction in synapsis and of auto-synthesis. He suggests that these

two properties may be connected, for if the property of specific attraction, which is characteristic of the gene as a whole, extends to its parts it is conceivable that a new gene may be built up alongside an existing one by attraction of the component parts which might be considered as already present in the protoplasm of the cell.
A suggested line of approach for the physicist is the study of X-ray diffraction using salivary gland chromosomes. The X-ray studies of virus proteins are also likely to yield important contributions.

758. KELLER, B. 575.17:576.12
(**Genetics and evolution**).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) **1936** : No. **12** : **23–32.**
The author traces the supposed course of evolution from inanimate to animate and thence to organized beings. Genes, together with bacteriophages and certain other bodies such as filterable viruses, are regarded as representatives of the stage immediately preceding the lowest type of living organisms such as bacteria. Chromosomes and the nucleus would appear to have evolved from these in much the same way as multicellular organisms from unicellular. Consequently the author regards symbiosis as of great evolutionary importance and considers hybrids as in some ways symbiotic forms. Heterosis may also possibly find its explanation on similar lines, also the labile condition of some of the plant characters observed in the experiments of Bonnier, Michurin, Lysenko, and others.

759. HÖFLER, K. 575.182:576.312
Die Rolle von Zellkern und Protoplasma bei der Vererbung. (**The role of the cell nucleus and protoplasm in inheritance**).
Wien. Landw. Ztg. **1937** : **87** : No. **25** : **197–98.**
The author discusses the present position of results from research on the role of nucleus and plasma in inheritance, the latter being given relatively lengthy treatment. A. B.

760. KNAPP, E. 575.243:537.5
Künstliche Mutationsauslösung in der Pflanzenzüchtung. (**Plant breeding and the artificial production of mutations**).
Forschungsdienst **1937** : **4** : **551–61.**
The subject of genom mutation by artificial means is reviewed. The treatments used increase the natural mutation rate and the mutations found are mostly recessive. Most is known of the effects of X-rays but ultra-violet light, changes in temperature, chemical and electrical agencies may also be employed.
It is hoped that in the future it will be found possible so to control mutation that specific treatments will produce specific mutations.

761. SCHWANITZ, F. 575.243:576.356.5
Experimentelle Erzeugung Polyploider Pflanzenrassen. (**The experimental production of polyploid plant races**).
Forschungsdienst **1937** : **4** : **455–63.**
In a lecture the various methods for the artificial production of polyploids are briefly reviewed and the value of such polyploid forms is discussed.
While there is no doubt that many such forms are of economic importance, there is need for careful testing of their fertility, resistance to disease and general vitality.

762. HJELMQVIST, H. 575.255
Ein Paar neue *Crataegomespili*. (**A few new *Crataegomespili***).
Hereditas, Lund **1936–37** : **22** : **376–94.**
In addition to *Crataegomespilus Asnieresi*, which has one layer of *Mespilus* tissue over a core of *Crataegus* and *Crataegomespilus Dardari* with two layers of *Mespilus* over a core of *Crataegus*, the author has discovered three new forms, *Crataegomespilus micrantha, intermedia* and *Pseudomespilus* which have respectively three, four and five layers of *Mespilus* over a core of *Crataegus*. A further form has a doubtful constitution.

763. Neilson Jones, W. 575.255
Chimaeras: a summary and some special aspects.
Bot. Rev. 1937 : **3** : 545–62.
The author deals with the different types of chimaeras—sectorial, periclinal and mericlinal, their mode of origin and methods of recognition. The use of chimaeras is shown to be of great importance in the study of developmental morphology.
Their economic importance has been as yet chiefly as ornamental plants and curiosities. More lately however it has been realised that the periclinal type may be of value in relation to disease resistance. The experiments of Jørgensen and Asseyeva* are described. In most known cases both components of the chimaera may keep their own immunity reactions with very little effect upon each other, but in some cases there seems to be an exchange of metabolites. The indirect effect of lack of balance between the components may lower vigour and render the plant as a whole more susceptible to disease. J. G. H.

764. Jakovlev, Ja. A. 575.4:575.24
(On Darwinism and some anti-Darwinists).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1937 : No. **4** : 17–26.
A plea (put forward in a lecture to workers and contributors belonging to the publishing concern Sel'khozgiz) for popular scientific literature for Russians. In considering Darwin's contribution to contemporary Russian thought, his theory of the origin of species is examined in relation to the theories of gene constancy, of homologous series and of Mendelism and is declared to be in accord with a theory of genetics which incorporates the acceptance of the mutability of the gene.

EVOLUTION 576.12

765. Reiser, O. L. 576.12:537.59
Cosmecology: a theory of evolution.
J. Hered. 1937 : **28** : 367–71.
A highly speculative discussion of the possible importance of cosmic rays in evolution.

766. Morgan, T. H. 576.12:575.24
Modern views of the evolution theory.
Amer. Scholar 1935 : 14–22.
A defence of the mutation theory of evolution.

CYTOLOGY 576.3

767. 576.312:582
Anderson, E. 575.127.2:576.16:576.356.5
Cytology in its relation to taxonomy.
Bot. Rev. 1937 : **3** : 335–50.
The author gives a general account of the way in which taxonomical and cytological information supplement each other, citing as an example the way in which the phylogenetic relationships of *Tradescantia* species in North America have been elucidated by cytological investigation.
The production of new species by amphidiploidy in interspecific hybrids throws a new light on the species problem, and indicates the possibility of reticulate phylogenies already realized by leading taxonomists. Moreover, not only does cytology in its purely morphological aspect affirm differences already noted from a study of external morphology, but it also indicates how these may have arisen. J. G. H.

* An abridged translation of this paper is on file at the Bureau.

768. Nebel, B. R. and
Ruttle, M. L. 576.353:581.04:576.356.5
Action of colchicine on mitosis.
Genetics 1938 : **23** : 161–62. (Abst.).

In a wide range of material the alkaloid colchicine in concentrations of 5×10^{-4} to 5×10^{-5} was found to stop mitosis during metaphase. In concentrations 5×10^{-5} to 10^{-6} binucleate cells and irregular divisions may be produced. The use of this drug for producing polyploidy and mutations is suggested (Cf. Absts. 771 and 772).

769. Snell, G. D. 576.354.46:575.17
Some considerations concerning the structure of chromosomes and genes.
Amer. Nat. 1938 : **72** : 84–94.

It is suggested that the pairing of chromosomes in meiosis is not due to forces of attraction acting at a distance but to something analogous to miscibility brought into play when the chromosomes are in close contact during the bouquet stage or in the synaptic knot.
The process of gene reproduction is also discussed.

770. Krajevoj, S. J. 576.356:538
(Influence of ultra-short waves on wheat and peas).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 13–14 (21–22) : 81–93.

Among the chromosomal disturbances produced by ultra-short (1–10 metres) waves are mentioned lagging at anaphase, reduction in length, chromatin bridges, micronuclei, chromosome fragmentation, "somatic" reduction and pseudo-meiotic divisions in somatic cells.

771. Blakeslee, A. F. and
Avery, A. G. 576.356.5:581.04
Methods of inducing doubling of chromosomes in plants by treatment with colchicine.
J. Hered. 1937 : **28** : 393–411.

Blakeslee, A. F.,
Avery, A. G. and
Cartledge, J. L.
Induction of polyploids in *Datura* and other plants by treatment with colchicine.
Genetics 1938 : **23** : 140–41. (Abst.)

Blakeslee, A. F.
Dédoublement du nombre de chromosomes chez les plantes par traitement chimique. (**Doubling of chromosome number in plants by chemical treatment**).
C.R. Acad. Sci. Paris 1937 : **205** : 476–79.

By treating seeds of *Datura* for 10 days with solutions of the alkaloid colchicine from 0·2 to 1·6 per cent, tetraploid shoots have been obtained with a frequency of 50 per cent and over. Tetraploidy has also been induced by applying the solution externally to primary meristems of growing plants. Success has been obtained with many unrelated genera of flowering plants, including *Nicotiana*, *Raphanus*, *Cucurbita*, *Trifolium*, *Medicago*, *Zea* and *Allium*. The most convenient method of determining tetraploids is by measurement of pollen grain size, which has been found to give a very reliable indication.
The applications of this method of inducing polyploidy to genetical and plant breeding work are discussed.

772. Nebel, B. R. and Ruttle, M. L. 576.356.5:581.04
The cytological and genetical significance of colchicine.
J. Hered. 1938 : **29** : 3–9.

Observations on living staminal hairs of *Tradescantia reflexa* in culture solution shewed that in concentrations of and above $10^{-4} \times 2$ molar, colchicine (mol. wt. = 399) prevents anaphase

separation, apparently by upsetting the spindle mechanism. Since the chromosomes divide normally, tetraploid nuclei are reconstituted. Whenever a cell is under the influence of the drug in early, mid- or later prophase its nucleus becomes tetraploid after metaphase, in which respect colchicine differs markedly from all other agents used to induce polypoidy. In a range of concentrations from $10^{-4} \times 2$ to 10^{-1} molar no essential difference in action was found and 1 hour, 6 hours and 24 hours treatment gave identical end results, provided effective concentrations were used.

The first cleavage division of artificially inseminated eggs of *Arbacia punctulata* is nearly ten times as sensitive to colchicine as *Tradescantia* stamen hair divisions.

Tetraploidy has been induced in marigolds, petunias, snapdragons, pinks and tomatoes by treating seedlings either by immersion of the shoots in 0·02 to 0·4 per cent aqueous solution or by applying a thin film of 1 per cent colchicine in lanolin to the growing points. In some cases even higher chromosome numbers were observed. Tetraploidy and occasional octaploidy was induced in clones of *Tradescantia reflexa* by treatment of cuttings.

773. 576.356.5:581.04:575.129

Colchicine and double diploids.

J. Hered. 1937 : **28** : 411–12.

An editorial note to the article reviewed in Abst. 771 above discussing the practical importance of amphidiploids, which might be produced by the colchicine method.

HORMONES 577.17

774. Veh, R. v. 577.17

Entwicklung und Stimulation. **(Development and stimulation).**

Züchter 1937 : **9** : 288–98 : 311–19.

The recent progress in the experimental investigation of the existence and activities of organisators, which control the development of the animal organism is briefly reviewed and the possible application of similar research to plants is considered.

A series of experiments with the seeds of apples, pears, quinces and cherries (already reviewed in "Plant Breeding Abstracts", Vol. VII, Absts. 275 and 1045), apricots, peaches, plums, mirabelles and cucurbits is described in which development was obtained without stimulation. The conclusions drawn from the results are that in all the plants investigated the embryo is, by itself, always in a state of readiness for development. The development is prevented by factors outside the embryo which in the vegetable marrow are, most probably, the dead tissue of the seed coat and in the other seeds the living endosperm tissue.

In a discussion on the part played by growth-promoting substances the author concludes that these are under the control of some other mechanism which regulates the development of the plant.

EXPERIMENTAL TECHNIQUE 578.08

775. Schwarze, P. 578.08:581.192

Methodisches zur Bestimmung des Rohproteingehaltes in Zuchtmaterial. **(Methods for the determination of the crude protein content in breeding material).**

Züchter 1937 : **9** : 319–21.

Certain modifications and improvements are noted for the methods described in a previous article (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 419).

BOTANY 58

776. 58

Bush, N. A. 576.16:581.9

(The progress of botany during the 20 years of Soviet power).

Priroda (Nature) 1937 : No. 10 : 141–50.

This article, bearing witness to the enormous amount of work undertaken in the U.S.S.R. during the past 20 years in botany, ecology and paleobotany, deals mainly with the numerous

floras and individual geobotanical surveys of the U.S.S.R. or its various regions. Some of these surveys aim at elucidating the origin of species and genera and in some cases, even of a whole flora.
The economic trend in research is admitted: anatomical studies of plants are closely allied with applied botany and the economic life of the nation. Large numbers of new institutes, etc., have been established for the study of crop plants and their selection, breeding, genetics, cytology and cultivation. Instances are cited of research in these spheres and also the study of chromosome structure and plant embryology applied to systematic classification, breeding and genetics.
Finally the list given of textbooks and monographs, etc., shews that the output of botanical literature has kept pace with the extensive developments in botanical research.

777. Vasil'ev, Ju. P. 581.162.3:581.331.23
(Controlling the process of fertilization).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods). Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I.V. Michurin) 1936 : No. 6 : 33–38.
In emphasizing the importance of eliminating sterility in distant crosses the possibility of inter-familial hybridization is mentioned. Michurin's work on artificial pollination is referred to as well as that of the author (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 121), which is exemplified by reference to a cross between the apple and the rowan.
A study of the physiological changes in the ovule and pollen is recommended and the relevance of the work of Laibach and Tukey on growing plant embryos in artificial media is pointed out. The author's findings which suggest that selective fertilization is due to physiological differences in the pollen available are mentioned and attention is drawn to the possibilities of pollination in artificial media to eliminate sterility in distant crosses.

AGRICULTURE 63

778. Pereverzev, N. S. 63.00.15(47)
(The Institute of Plant Industry in the third Five Year Plan).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 6 : 53–57.
An outline is given of the programme of work of the Leningrad Institute of Plant Industry in the third Five Year Plan.

779. 63.00.15(73)
Chew, A. P. 575:633
The response of Government to agriculture. An account of the origin and development of the United States Department of Agriculture, on the occasion of its 75th anniversary.
Washington 1937 : Pp. 107.
Among the activities of the United States Department of Agriculture described in this publication is the work on plant introduction and plant breeding.

FIELD TESTS 631.421

780. Ma, P. C. 631.421
(New conception of field experimentation).
J. Agric. Ass. China 1937 : No. 158 : 13–20.
A comparison and the methods of lay-out for randomized blocks and Latin squares as well as the detailed procedures for the analysis of variance are presented. T. C. C.

781. Visser, W. C. 631.421
De Ongelijkmatigheid van den grond en de nauwkeurigheid bij proefvelden. **(Soil-heterogeneity and accuracy of trial plots).**
Versl. RijkslandbProefst., 's Grav. 1937 : No. 43 (7) A : 225–70.

In this publication a method is suggested to reduce the experimental error of field experiments. The procedure is demonstrated with data obtained from manuring experiments carried out by the "Borger Compagnie" and others in Holland.

Known methods to eliminate systematic fertility trends from the experimental error are said to be either too coarse or too complicated. The method of the author consists in constructing graphically a "fertility map" of the experimental site, with the help of which "corrected yields" are calculated. Details of the procedure are given for the special case of a fertility trend passing through the field in one direction only (column differences but no row differences in fertility). In this case the graphical method of constructing the fertility levels of the "columns" is virtually equivalent to finding the average yields of the "columns" and correcting them for the average *p*H value of the soil of the respective "columns." Alternatively an estimation of the phosphoric acid is used instead of the *p*H value.

The method, although based on a most careful study of fertility trends on a large number of trial fields for a series of consecutive years, is admittedly subjective. It is therefore difficult to use its reduced error for a rigorous test, owing to the uncertainty of the reduction in the degrees of freedom.

It is interesting that the author has come across examples, in which there was no or a negative correlation between the experimental yields and the yields of uniformity trials preceding the experiment proper.

On applying his method to certain experiments on potatoes carried out in Holland the author finds that the experimental error is increased. The failure of the method in these cases is said to be due to the soil-homogeneity, which makes a construction of the fertility map unnecessary and the corresponding correction undesirable. According to the author's general observations such a soil homogeneity generally coincides with soil conditions being ideal for the crop grown, i.e. other factors being equal, with a high average yield. It would be interesting to follow up this point further, as a significant (negative) correlation between the average and the standard deviation of yield samples is incompatible with certain assumptions commonly used in the analysis of field experiments. H. O. H.

782. Chang, C. C. 631.421(51)
(A new method of randomized field arrangement involving a large number of varieties of crops).
J. Agric. Ass. China 1937 : No. 158 : 48–56.

The disadvantages of testing separately a large number of varieties for preliminary elimination are first discussed. Yates' pseudo-factorial method is described for the benefit of Chinese workers. In conclusion, the author points out that for some of the experimental stations in China too much land would be required. T. C. C.

PLANT DISEASES 632

783. Müller, K. O. 632:634:575
Phytopathologie und gärtnerische Pflanzenzüchtung. (**Phytopathology and horticultural plant breeding**).
Forschungsdienst 1937 : 4 : 357–63.

Close co-operation between the phytopathologist and the plant-breeder is essential for the control of various diseases attacking cultivated plants. The lecturer points out some of the results already achieved and mentions other problems still awaiting solution.

784. Cotter, R. U. and Levine, M. N. 632.452:575.12:576.16:633.1
Experiments in crossing varieties of *Puccinia graminis*.
Phytopathology 1938 : **28** : p. 6. (Abst.)

Pycnidial nectar of *P. graminis agrostidis* was mixed with that of *P. gr. tritici*, *P. gr. secalis*, *P. gr. poae* and *P. gr. avenae* respectively.

Though aecidia were only produced in 35 per cent of the 382 crosses attempted, some were produced from every combination, though no uredial stage was obtained from *agrostidis* x *avenae* or its reciprocal.
From *tritici* x *agrostidis* were obtained 16 *tritici* and 2 *hordei* races; from *agrostidis* x *tritici*, 2 *hordei* and 1 *secalis* race; from *secalis* x *agrostidis*, 9 *tritici*, 4 *secalis* and 1 *avenae*; from *agrostidis* x *secalis*, 4 *tritici* and 1 *secalis* and from *poae* x *agrostidis*, 3 *tritici* races.
Some of the races produced were common races, others were new. The *hordei* races though limited to barley as a cereal host, differed in parasitism on three varieties of barley.
From the cross *tritici* 17 x *agrostidis* a strain was isolated producing fairly severe infection on Gopher oats in addition to attacking different varieties of barley.

785. Stakman, E. C. and Cassell, R. C. 632.452:576.16:633.11(73)
The increase and importance of race 56 of *Puccinia graminis tritici*.
Phytopathology 1938 : **28** : p. 20. (Abst.)
In 1928–31 inclusive, race 56 constituted 1 per cent or less of uredial isolates identified by the authors in the U.S.A., whereas in 1937 (to November 1), the percentage was 56. There is evidence that it originated on barberry and was largely responsible for the collapse of Ceres wheat, moderately to highly resistant to stem rust prior to 1935. In 1937 race 56 constituted about 70 per cent of the isolates from Ceres.

786. Finn, W. 632.5:581.3:576.312.35
(Comparative embryology and karyology of some *Cuscuta* species).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. **12** (20) : 83–105.
The embryology is described in some detail. Division of the generative cell was observed to occur in the pollen grain.
The following haploid chromosome numbers are recorded: *C. Epithymum* Murr. var. *vulgaris* Engelm., 7; *C. europaea* L., 7; *C. Viciae* Koch. Schn. Schoen., 7; *C. cupulata* Engelm., 7; *C. approximata* Babingt., 14; *C. monogyna* Vahl., 14; *C. reflexa* Roxb., 14; *C. Epilinum* Weihe., 21; *C. arvensis* Beyr. var. *calycina* Engelm., 28. The three species belonging to the sub-genus *Monogyna*, *C. monogyna*, *C. lupuliformis* (chromosome number not given) and *C. reflexa* have long V-shaped chromosomes, while the other species, of which *C. arvensis* belongs to the sub-genus *Grammica* and the rest to the sub-genus *Cuscuta*, have short, rod-shaped chromosomes.

787. Wille, J. E.,
Ocampo, J. A.,
Wéberbauer, A. and
Schofield, Q. D. 632.951.1(85)
El cube (*Lonchocarpus nicou*) y otros barbascos en el Peru. [**Cube (*L. nicou*) and other barbascos in Peru**].
Bol. Minist. Fom., Lima 1937 : No. 11 : Pp. 117.
In this monograph botanical descriptions are given of the plant *Lonchocarpus nicou*, together with details of its cultivation and yield in different parts of Peru. Information is given on its mode of cultivation, chemical constituents of the root, its efficiency as a source of rotenone together with the methods of extracting this principle and data on its efficacy as an insecticide in connexion with a large number of different organisms.
Cube is a native of Peru and a considerable range of varieties is known to exist. Studies of these are to be made in order to select those with the highest rotenone output.

ECONOMIC PLANTS 633

788. Vavilov, N. I. 633(47)
(Plant Industry of the U.S.S.R. in the third Five Year Plan).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1937 : No. 7 : 42–52.
The urgent necessity for raising the crop production of the Soviet Union leads the author to suggest a number of lines whereby this could be effected, the crops being dealt with in turn. In addition to improving and extending all the main crops many new or little grown plants are suggested as worthy of more attention.

789. Berg, K. H. v. 633:575:576.3
Die Zytologie in der Pflanzenzüchtung. (**Cytology in plant breeding**).
Forschungsdienst **1937** : **4** : 561–71.
The importance of cytology to plant-breeding is discussed and illustrated by examples of how cytology has helped in an understanding of genetical problems.
The trisomic forms of *Datura*, the occurrence of haploids, triploids and polyploids, etc. are quoted to shew how cytology makes contributions to genetics.

790. Fischer, A. 633:575:581.9
Geographie und Züchtungsforschung. (**Geography and breeding research**).
Z. Erdkunde **1936** : **4** : 385–95. (Abst.)
That a knowledge of geography, including climatology and soil science, may be of practical value to the plant breeder is shewn by consideration of the importance of knowing, for instance, something of the natural conditions of growth of the wild forms of cultivated plants, such as length of day; and the fact that there is a close connexion between latitude and the chemical composition of oil and the relation between climate and disease resistance.
Plant breeding in turn has also had an effect on the geography of certain plants by extending their natural limits of cultivation.

791. Spennemann, F. 633–1.531.12(43.6)
Die Neuordung der Saatgutwirtschaft. (**The new organization of seed production**).
Wien. landw. Ztg. **1937** : **87** : No. 21a : 27–28.
The new organization of seed production in Austria and the regulations dealing with the economic and commercial aspect of the production of pure seed are explained, with references where necessary to sources from which further information on the subject can be obtained. The changes concerned apply to clover, grasses and other crops. A. B.

792. Boonstra, A. E. H. R. 633–2.111–1.521.6
Winterhardheid. (**Winterhardiness**).
Landbouwk. Tijdschr. Wageningen **1936** : **48** : 422–26 ; **1937** : **49** : 479–85.
The work of S. T. Dexter and other workers on the physiological basis of winter-hardiness is reviewed.

793. 633.00.15(59.7)
634.00.15(59.7)
633.15:575.42(59.7)
Réteaud, L. 633.853.55:575.42(59.7)
Institut des Recherches Agronomiques et Forestières. Compte-rendu des travaux 1935 et 1936. (**Report of the activities of 1935 and 1936**).
Inst. Rech. Agron. For. Hanoi **1937** : **1** : Pp. 175 : **2** : Pp. 440.
In the first volume the work of the various departments and the organization and activities of the institute and its sub-stations is reviewed.
The work includes the improvement of tea, coffee, cocoa, *Aleurites*, sugarcane, tobacco, cinchona, kapok, soya bean, maize, *Ricinus* and various tropical fruits.
Volume II gives details of the work carried out by the various laboratories and the departments of Genetics, Forestry and Fishery. The work on the selection of maize and *Ricinus* is reported in great detail.
Of maize, 124 varieties (68 indigenous varieties, 5 varieties from southern Indo China and 51 imported varieties) were tested. Of these 9 are being further selected and 27 are being grown with a view to future selection. One brown variety, Maize 52, will, it is hoped be ready for multiplication for seed by the end of the season.
The description of the work of selection of *Ricinus* is preceded by a review of the literature and of the work that has been done in some of the countries where *Ricinus* is cultivated.

Forty-six varieties of *Ricinus* were collected and grown in order to establish the most suitable forms for selection. Their behaviour and that of their progeny up to the second generation is described in detail.
The results indicate that among the forms available are some which surpass in many respects those generally cultivated in Tonkin and that it only remains in many cases to fix the types required.

CEREALS 633.1

794. 633.1:575(43.6)
MAYR, E. 633.14:575(43.6)
Ergebnisse der Erkennungsversuche der im Zuchtbuch eingetragenen Getreidesorten. II. Sortenbeschreibung der Roggenzuchtsorten. (**The results of the tests for approval of the varieties of cereals entered in the breeding register. II. A varietal description of the standard varieties of rye**).
Landeskultur 1937 : **4** : No. 3 : 71–74.
The varietal description is more difficult in the case of rye than in wheat. The author distinguishes three types of rye which resemble and extend Pammer's classification. In addition to the type of the ear, growth and leaf breadth of the seedling, growth and leaf breadth during subsequent development and the time of shooting, have been utilized in describing the varieties. The survey is presented as a preliminary communication. A. B.

795. JUNG, E. 633.1–1.547.1:575
Schutz der Getreideernte. (**Protecting the grain harvest**).
Wien. landw. Ztg. 1937 : **87** : No. 28 : 221–22.
Inter alia the author emphasizes the importance of breeding varieties with a long dormant period that do not germinate in the ear. Successful results have already been attained. A. B.

796. 633.1–2.4–1.521.6:581.03
LASSER, E. 633.1–2.4–1.521.6:581.143.03
Der Einfluss von Licht und Jarowisation auf den Befall von Weizen, Hafer und Gerste durch *Tilletia, Ustilago* und *Helminthosporium*. (**The influence of light and vernalization on the infection of wheat, oats and barley by *Tilletia, Ustilago* and *Helminthosporium*.**)
Kühn-Arch. 1937 : **44** : 161–211.
The effect of artificial light during the winter months was to hasten earing by 3–4 weeks for oats and 4–9 weeks for wheat. Increased temperatures also accelerated earing but to a lesser degree. Neither light nor temperature altered the usual degree of infection by *Ustilago* or *Tilletia*. The infection of barley by *Helminthosporium gramineum* in the greenhouse was considerably less than that in the field.
Vernalization also had the effect of decreasing the infection and should therefore not be used as a method for hastening development when testing for resistance.

WHEAT 633.11

797. BARBACKI, S.,
LEWICKI, S.,
MICZYŃSKI, K. (Jr.) and
SŁABOŃSKI, A. 633.11(43.8)
Pszenice Polskie. (Opis odmian z kluczem do oznaczania). [**Polish wheats. (Description of the varieties with a key to their determination)**].
Bibl. Puławska 1937 : No. 15 : Pp. 163.
Standard descriptions are given of some 106 varieties of wheat cultivated in Poland, with illustrations of spikes and grains. A dichotomous key is given and also an alphabetical index. The varieties all belong to *Triticum vulgare* except Puławska Twarda, which belongs to *T. durum*.

798. VALLEGA, J. 633.11:575(82)
Selección de trigos realizada en el Instituto Fitotécnico de la Facultad de Agronomía de la Plata. (**Wheat breeding carried out at the Institute of Plant Industry of the Faculty of Agronomy of La Plata**).
Rev. Argent. Agron. B. Aires 1937 : 4 : 207–10.

From a cross of Heines Kolben (resistant to *Puccinia glumarum tritici*, *P. triticina* and *P. graminis tritici*) with the local variety 38 M.A. (resistant to *P. triticina* and *Ustilago tritici*) segregates have been obtained which combine resistance to the three rust species with immunity to *U. tritici*, vigorous growth, good standing capacity and high yield. Their quality, however, is only moderate.
Forms resistant to *P. glumarum* and *P. triticina* have also been isolated from the cross Ardito x Lin Calel; some of these are distinguished too by vigour, good yield and high gluten quality. The cross Riccio x Lin Calel has produced some strains of very high quality.
Hybrids of Hope x Lin Calel are low in yield; only very few gave yields equal to the standard, La Previsión 25. They were, however, resistant to the three rust species and free from *U. tritici* and of good grain quality.
Promising hybrids have also been produced from the crosses Chino 166 x Lin Calel, Mentana x 38 M.A., and 12 H 3 x 38 M.A.

799. JAKUBTSINER, M. M. 633.11 *T. durum* :575:581.48
(**The large-grained wheat *falcatum***).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 4 : 26–28.

The grain in the variety *falcatum* is larger than in any other variety of *T. durum*. The ear is also large and the variety is very resistant to diseases and to lodging; it reacts well to irrigation and manuring and is a very useful variety for hybridization.

800. SAPEHIN, A. 633.11:575.127.2:575.11
(**The peculiarities of the segregation in hybrids of *vulgare* and *durum* wheats**).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 13–14 (21–22) : 15–61.

In the F_2 of *Triticum vulgare* x *T. durum* segregations of many characters were studied separately in the *durum* and *vulgare* groups. It was found that pure Mendelian ratios were encountered only as rare exceptions. In the majority of cases marked deviations were found and the two groups differ greatly in their behaviour.
An unexpectedly large number of homozygotes occurred.
The possible causes of this behaviour are discussed.
Some economically promising varieties have been bred from pentaploid hybrids of this type.

801. 633.11:575.127.5:633.11 *Aegilops*
SOROKINA, O. N. 633.11 *T. vulgare*:576.16
A fertile and constant 42-chromosome hybrid *Aegilops ventricosa* Tausch. x *Triticum durum* Desf. (**On the problems of the synthesis of soft wheat**).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 5–12.

Descriptions and illustrations are given of a vigorous, fertile hybrid appearing in the F_5 of the cross *Ae. ventricosa* (2n = 28) x *T. durum melanopus* (2n = 28). The hybrid shewed a marked resemblance to *T. vulgare*.
The F_1 plants of the cross were intermediate, with 0·21 per cent fertility. Eleven F_2 plants were obtained, representing forms similar to F_1, or more like *Aegilops* in type, with very few of a more wheat-like character. The F_3 plants were more like wheat, some shewing characters of *T. vulgare*, others of *T. Spelta*; some were amphidiploids. The F_4 and F_5 plants of the *T. vulgare* type varied in a number of minor characters.
The vigorous F_5 plants described came from an F_2 of the intermediate type. They had 42 somatic chromosomes and did not segregate. Very few irregularities were observed in pollen grain formation and the hybrid crossed perfectly normally with *T. vulgare* varieties.

Some of the hybrids have been characterized by tightly enclosed grains, a character of use in reducing shedding.
It is thought probable that the hybrids arose by chromosome duplication in an F_2 plant but the possibility of fertilization by pollen from *T. vulgare* is not excluded.

802. Homedes I Ranquini, J. 633.11:575.127.5:633.11 *Aegilops*:576.356.5
Estudi citològic sobre la formació del pol·len en un híbrid *Aegilops* (*triuncialis*?) ♀ (n = 14) x *Triticum vulgare* var. *graecum*, Körn ♂ (n = 21), sota condicions de medi anormals. (**A cytological study on the formation of the pollen in a hybrid *Aegilops* (*triuncialis*?) ♀ (n = 14) x *T. vulgare* var. *graecum*, Körn ♂ (n = 21), in abnormal conditions of the medium**).
Arxius, Barcelona 1936 : N.S. **2** : Fasc. IV : 523–44.
A natural hybrid between *Aegilops* sp. and *T. vulgare* found in a wheat field in Spain in 1932 and distinguished by unusual fertility was examined. Morphologically the plant corresponded to a hybrid of *Ae. triuncialis* x *T. vulgare* var. *graecum*, both of which moreover occurred in the locality.
Descriptions are given of meiosis in the hybrid. In some cells (about half the total number) in addition to univalents, a number of bivalents, trivalents and more complex associations occurred. Pollen grains were irregular in size and in chromosome number. Other cells contained only univalents, owing to the failure of synapsis, which is ascribed to the hot arid conditions in which the plant was found growing. Such cells frequently resulted in daughter cells with the full diploid chromosome number and are thought to be a likely means of leading to tetraploidy.

803. Miège, E. 633.11:575.127.5:633.11 *Aegilops*:664.641.016:575.11
Sur la composition chimique des *Triticum*, des *Aegilops* et de leurs hybrides. (**On the chemical composition of *Triticum*, *Aegilops* and their hybrids**).
C.R. Acad. Sci. Paris 1937 : **205** : 928–29.
The species *Aegilops ovata*, L. var *nigra* B.R. and *typica* Eig. *Ae. triuncialis* L. ssp. *Ae. triaristata* Willd. var. *typica* Eig. *Haynaldia villosa* (L.) Schun., *Triticum durum* Desf. var. *melanopus* K. and *T. vulgare* H. var. *albo-rubrum* K. and the hybrids of these last two with *Ae. ovata* var. *nigra*, though closely related botanically, differ very considerably in the chemical composition of their hulled grain. The most important differences are in the greater amount of mineral matter, nitrogen and gluten in *Haynaldia* and *Aegilops* and the greater amount of starch material in *Triticum*.
In the F_3 hybrids the characters of the wild parent predominate. In the F_4, where morphologically the characters tend to resemble those of the wheat parent, the chemical composition of the grain is more like that of *Aegilops*, though to a lesser degree than in the earlier generations. The recessive nature of the properties, low content of mineral matter and low nitrogen, is confirmed and supports the results of Šibaev with *Agropyrum* x *Triticum* ("Plant Breeding Abstracts", Vol. VII, Abst. 587) and of Sosa Bourdouil on *Zea* x *Euchlaena* ("Plant Breeding Abstracts," Vol. VI, Abst. 533).

804. Miège, E. 633.11:575.127.5:633.11 *Aegilops*:664.641.016:575.11
Sur les qualités boulangères des *Triticum*, des *Aegilops* et de leurs hybrides. (**On the baking qualities of *Triticum*, *Aegilops* and their hybrids**).
C.R. Acad. Sci. Paris 1937 : **205** : 1436–37.
A comparison of the baking quality of the species of *Aegilops*, *Triticum* and their hybrids already noted (See Abst. 803 above) shewed that the quality of the bread behaves as a transgressive character. The character in the hybrids with *T. durum* tends to resemble that of the wild parent in the F_3 and F_4 while in the hybrids with *T. vulgare* the reverse effect is observed.
The results indicate that the use of *Aegilops* as a parent may improve the baking value and the quality of the bread.

805. Tschermak-Seysenegg, E. 633.11:575.127.5:633.14
Wirkliche, abgeleitete und fragliche Weizenroggenbastarde (*Triticale*-Formen). [**True, derived and doubtful wheat-rye hybrids (*Triticale* forms)**].
Cytologia, Tokyo 1937 : **7** : 1003-11. Also Akademischer Anzeiger 1936 : nr. 20.

The wheat-rye hybrid obtained by Rimpau in 1888 is described as typical of a true, constant intermediate additive hybrid with 56 somatic chromosomes. That both awned and awnless forms have occurred among the progeny is attributed to a tendency for mutation in one of the original parents.
Other wheat-rye hybrids have been produced by back-crossing the sterile wheat-rye hybrids with wheat. These derived hybrids have mostly shrivelled grains but the author has bred similar forms of practical value.
The doubtful hybrid is that described by Kattermann (cf. "Plant Breeding Abstracts", Vol. II, Absts. 590 and 591), the progeny of a cross between *Triticum vulgare* x *Aegilops ovata* with blue grain, held to be due to pollination with a plant of *Secale* but more probably due, it is suggested, to the coloured aleurone layer already present in wild strains of rye, wheat and barley.

806. Kattermann, G. 633.11:575.127.5:633.14:.576.354.4:581.44:575.061.5
Das Verhalten des Chromosoms für Behaarung roggenbehaarter Nachkommen aus Weizenroggenbastardierung in neuen Kreuzungen mit Roggen und Weizen. (**The behaviour of the chromosome for the pubescence of progeny with rye pubescence obtained by wheat-rye hybridization in new crosses with rye and wheat**).
Z. indukt. Abstamm.-u. VererbLehre 1937 : **74** : 1–16.

In confirmation of the assumption already expressed (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 109 and 459) that the speltoid strain with a pubescent stem is the result of hybridization with rye and carried a rye (B) chromosome, crosses were made between these speltoid plants and rye and wheat. The progeny of the cross with rye had a very strongly pubescent stem below the ear. A cytological examination of the first division of the pollen mother cells of the F_1 wheat and rye hybrids shewed the presence of a bivalent, the shape and chiasmata of whose components corresponded with that of the B chromosome which had obviously found a homologue with which to pair. An analysis of the frequency of the various conformations of the B chromosome and other data confirmed the assumption.
The progeny of the cross with wheat had a much less pubescent stem than that of the wheat-rye cross. An examination of the pollen mother cells revealed with very few exceptions at least two chromosomes that did not pair, of which one was the B chromosome. A high proportion of multivalents was characteristic of this cross.

807. Hižniak, V. A. 633.11:575.127.5:633.289:576.356.5
Wheat-Quitch amphidiploids.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : **17** : 489–90.

Amphidiploids were produced by selfing the F_1 of the wheat-couch grass hybrids obtained by crossing the following wheat species with *Agropyrum intermedium*:—*Triticum durum*, *T. dicoccum*, *T. turgidum*, *T. polonicum*, *T. persicum*. The amphidiploids all shewed 70 somatic chromosomes. Meiosis was fairly regular and the pollen was 95·97 fertile, 1·6 2 grains were formed on every ear.
The value of these amphidiploids as plants for fodder is noted.

808. Sorokina, O. N. 633.11:575.129:633.11 *Aegilops*:576.356.5
(**New *Aegilops*-wheat amphidiploids**).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 161–73.

In recent years over 85 different hybrids between different species of *Aegilops* and wheat or rye have been produced but very few of them have given an F_2 generation. Of these several have proved to be amphidiploids. All the hybrids between 14 chromosome parental species,

namely *Ae. triuncialis*L. x *Triticum polonicum* var. *pseudo-Martinari* Körn., *Ae. triuncialis* L. x *Tr. dicoccoides* var. *spontaneonigrum* Flaksb., *Ae. triuncialis* L. x *Tr. dicoccum* var. *farrum* Schöbl., in the later generations had 56 chromosomes. The hybrid between 7 and 14 chromosome species, e.g. *Ae. longissima* (Schw. et Muschl.) Eig. x *Triticum durum apulicum* Körn., was mainly sterile but produced one or two good pollen grains which were used in self-pollination, by which means two grains were obtained and these again gave fertile, constant progeny which were amphidiploids.

The morphological characteristics of the various amphidiploids are described, with illustrations. Detailed examinations of the amphidiploid *Ae. longissima* x *T. durum* are reported. The F_1 plant had 21 somatic chromosomes, which formed few if any bivalents at metaphase I. In some cells the univalents were arranged regularly in equatorial plates and shewed clear indications of splitting. Later they seemed to divide, the halves passing to the poles; no further splitting of the univalents occurred and a dyad was formed. The amphidiploid is thought to have originated by the union of two of these unreduced gametes and indeed the F_2 plants were found to have 42 chromosomes, their meiosis being almost entirely regular. This mode of origin is shewn to be different from that of the *Aegilotricum* amphidiploids observed by other authors.

The amphidiploid *Ae. longissima* x *T. durum* is rust resistant and is being used on this account in hybridization with *T. vulgare*, with which it crosses, giving a 10 per cent set.

809. 633.11:575.242:576.356.5

Tumanian, M. G. 633.11 *T. monococcum*

The occurrence in nature of polyploid mutations in wild monococcal wheat.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : **16** : 325–27.

A number of cases are recorded in which dicoccal forms have occurred among the progeny of monococcal plants.

A more detailed description is given of the finding of an ear differing markedly from the others on a wild, single-awned monococcal plant of the variety *melanorubrum*.

In external characters the mutant ear resembled the original forms but was considerably larger. It was found to have twenty-eight chromosomes and has been recognized as a new species and named *Triticum jerevani*.

The points of difference from *T. dicoccoides* are noted and it is suggested that this case throws light on the probable origin of the present forms of polyploid wheat species.

810. Broekema, C. 633.11:575.42(49.2)

Tarwekeus. **(Wheat selection).**

Erfelijkheid in Praktijk, Leiden 1937 : **2** : 41–42.

The early work on wheat improvement is briefly outlined with notes on some of the outstanding wheats produced and attention is drawn to the potential value of the new French varieties and the forms that might be bred from the De Joncquois type. The latter with Benoist 40 and a series of Vilmorin Andrieux's wheats offer first class breeding material for the production of varieties superior to Dutch varieties such as Juliana.

Comparative data of yields of French, German and Scandinavian wheats are given with observations on their relative cold resistance and requirements of manures.

811. Matsumura, S. 633.11:576.312.35:575.127.2

Endosperm development in relation to chromosome numbers in back-crosses of pentaploid wheat hybrids. (A preliminary note).

Jap. J. Genet. 1937 : **13** : 227–28.

When the F_1 plants from hybridizations between Emmer wheats and Bread-wheats are back-crossed with their parents, hybrids of four different kinds of combinations can be obtained. In plants from F_1 x Emmer and in Bread-wheat x F_1, the grains are plump (unwrinkled) and their germination is good, whereas in the plants from F_1 x Bread-wheat and in Emmer x F_1 the grains appear wrinkled (although long), and germination is poor. The relationships between the chromosome numbers (in root-tips) and the form of the grains are as follows:— in F_1 x Emmer, as the chromosome number increases the size of the grains decreases, and the

grains whose embryo has 2n = 35 chromosomes resemble the F_1 of Bread-wheat x Emmer. In Bread-wheat x F_1 those with 2n = 35 chromosomes are small, and as the chromosome number increases the size of the grains also increases. In Emmer x F_1 the grains whose embryo has 2n = 28 or 29 are plump, but as the chromosome number increases the number of wrinkled grains and the degree of wrinkling increases. Those with 2n = 35 chromosomes resemble the F_1 of Emmer x Bread-wheat. In F_1 x Bread-wheat too those with 2n = 35 are exceedingly wrinkled, and as the chromosome number increases the grains become plumper. Tables shewing the chromosome numbers and the corresponding genom formulae of embryos and endosperms in the two back-crosses and also the genom formula of the endosperms in the reciprocals of the back-cross.

It is concluded that the form of the grains is determined by the genom formulae of the endosperms and attention is drawn to the following correlation: in the combinations of F_1 x Emmer and Bread-wheat x F_1 the grains are plump and their endosperms contain some genom D chromosomes in the diploid condition. On the other hand, in the combinations of Emmer x F_1 and F_1 x Bread-wheat the grains are wrinkled (although long), and their endosperms contain some genom D chromosomes in the haploid condition.

812. 633.11:576.356:575.243:537.531
Smith, L. 633.11:575.116.1
Cytogenetic studies in *Triticum monococcum*.
Genetics 1938 : **23** : p. 168. (Abst.)

There have now been noted 19 cases of sterility resulting from X-ray treatment, 11 of which are associated with abnormalities of meiosis in pollen mother cells. These eleven, which are apparently inherited as simple recessives, can be divided into five groups, three of which have already been described (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 827 and Vol. VII, Abst. 1210) two of them under the names "dissociation a and b" and "dissociation c." Two new types are mentioned, in one of which diakinesis and first metaphase chromosomes are shorter than usual and univalents are often present and in the other frequent dyad formation occurs, giving rise to numerous tetraploid offspring. The other eight cases of sterility involve abortion of the anthers (3 cases), lack of starch in mature pollen (4 cases) or abnormal contents in the microspores.

Reduction in seed set amounts to 6 per cent in plants with a ring of 4 chromosomes, 27 per cent in plants with a ring of 6 and 22 per cent in plants with two rings of 4. Pollen abortion is correspondingly low in these three types, though chromosome segregation in the pollen mother cells does not appear to be directed.

Haploids, triploids and trisomics have been studied.

Five linkages involving 10 genes for seedling and mature plant characters have been found.

813. Love, R. M. 633.11:581.46:576.356.2.061.6
A cytogenetic study of white chaff off-types occurring spontaneously in Dawson's Golden Chaff winter wheat.
Genetics 1938 : **23** : p. 157. (Abst.)

The white-chaffed forms are homozygous for a deficiency involving one arm of a chromosome. The heterozygotes, which are phenotypically normal, have a heteromorphic bivalent. The white-chaffed plants have longer glumes than the normal, suggesting that genes for glume length are linked with those for glume colour.

A plant with a heteromorphic bivalent such as is found in the heterozygotes has been observed to occur in the progeny of a 41-chromosome plant which had a duplication on the univalent. Pairing of the duplicated segments resulted in chromosome breaks at first anaphase.

814. Radulescu, E. 633.11–2.451.3:575.41
Uebt die Weizensorte eine selektive Wirkung auf *Tilletia*-Arten aus? (**Does the wheat variety exert a selective action on *Tilletia* species ?**)
Z. PflKrankh. 1938 : **48** : 39–42.

Experiments in which six varieties of wheat were infected with a mixture of spores of *Tilletia tritici* and *T. foetens* in different proportions shewed that the individual wheat varieties had a selective effect on the increase and decrease of the species of *Tilletia*.

815. Vogel, O. A. and Holton, C. S. 633.11–2.451.3–1.521.6:575.11
Reaction of F_3 progenies of an Oro x Turkey-Florence cross to two physiologic races of *Tilletia tritici* and one of *T. levis*.
J. Amer. Soc. Agron. **1938** : **30** : 55–59.

Oro is susceptible to the *T. levis* race L–8, Turkey–Florence is susceptible to the *T. tritici* race T–11 and both are slightly susceptible to T–8 and resistant to the other known races. Data are presented to shew the reaction of F_3 progenies of Oro x Turkey–Florence to the three races mentioned. Of 190 F_3 progenies, 8 had less than 5 per cent bunt when inoculated with L–8, 33 out of 188 had less than 5 per cent with T–11 and 33 out of 168 had less than 5 per cent bunt for the three races and selections from one of these, 1098, continued to be highly resistant in F_4 in 1936. In 1937 selections from the latter were bunt-free with 18 individual races and produced from 3 to 23 per cent of bunted heads with L–8, mostly of the partially bunted type. There was no correlation between the percentages of bunt produced by races L–8 and T–11 in the F_3 progenies and only a low correlation between races L–8 and T–8 ($r = 0{\cdot}4242$, $P = 0{\cdot}01$). The correlation between the bunt produced by T–11 and T–8 was rather high ($r = 0{\cdot}7477$, $P = 0{\cdot}01$).
A repetition for genetical analysis is now in progress.

816. Crépin, C.,
Bustarret, J. and
Chevalier, R. 633.11–2.451.3–1.521.6:575.11(44)
Le problème de la création de blés résistants à la carie. **(The problem of the creation of wheats resistant to bunt).**
Ann. Épiphyt. Phytogénét. **1937** : **3** : (N.S.) : 323–439.

This extensive survey of the questions relating to the breeding of bunt resistant wheats for France, starts with the data on the biology of *Tilletia Tritici* and *T. levis*, the methods for artificial infection, the results of trials of large numbers of varieties of wheat made at the Research Station at Dijon and the existence of physiological forms of the fungus. The data and literature on the genetics of resistance are then reviewed and the hybridization work carried out at Dijon from 1928–1936 is recorded. Hussar and Martin were the first varieties which shewed resistance to the local races of bunt and these were used as parents in crosses with susceptible varieties. In other crosses, Baulmes, Ridit 3, Hosar and Hohenheimer 77 were also used. The results agreed with the findings of other workers that Hussar has two factors for resistance. Martin was found to possess more than one factor for resistance and one of these is probably dominant. The data were not sufficient for a precise determination. The resistance of the variety Baulmes was not dominant. Crosses were also made between resistant varieties. The production of a wheat resistant to bunt is therefore attainable without great difficulty and the creation of a variety that combines resistance with other economic qualities is only a matter of time.
A bibliography of 163 titles completes the paper.

817. Voss, J. 633.11–2.451.3–1.521.6:578.081
Zur Methodik der Prüfung von Weizensorten auf ihre Widerstandsfähigkeit gegen Steinbrand (*Tilletia tritici*). [**A technique for testing the resistance of wheat varieties to bunt (*T. tritici*)**].
Pflanzenbau **1937** : **14** : 113–53.

The details and results of a method for growing wheat plants for testing for resistance to bunt are described. The grain was infected with the spores of the fungus and then grown in a greenhouse with continuous illumination. With this treatment the amount of infection could be estimated in 6–8 weeks.
Results are given first on varieties of spring wheat grown in the greenhouse and under different temperatures during germination. These are compared with experiments made in the field.
Similar experiments are then described for winter wheats.

818. Gorlatsh, A. A. 633.11–2.452–1.521.6
(Heredity in resistance to brown rust in hybrids of wheat).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1936 : **12** : Nos. 5–6 : 138–51.

Crosses of varieties from populations of *Triticum vulgare* Will. that had undergone individual selection were tested under field conditions for resistance to *Puccinia triticina* Eriks. In the F_1 resistance was inherited as dominant, intermediate and recessive in three different crosses respectively. Observations on the F_2 of certain crosses and, in some cases, the F_3, led the author to postulate a resistance factor *R* and a factor for partial resistance *S*; and to allot certain schematic genotypes for resistance to the different varieties used in the experiments. Resistance in certain crosses appeared to be conditioned by two genetic factors, though, owing to the presence of *S* in both parents, only a monohybrid ratio appeared in the F_2. Admittedly, however, a much larger number of plants would be required in order to analyse the exact mode of inheritance of the character in question which is probably much more complicated than the provisional scheme here adopted shews. Nevertheless a study of a series of constant resistant forms and somewhat susceptible forms among the F_5 from certain crosses is regarded as demonstrating that by a single process of selection from the F_2 numerous resistant forms closely approaching the non-susceptible parent form can be obtained and that therefore the proposed scheme of the mode of inheritance is probably correct. No forms superior in resistance as compared with the parent forms could be isolated.

Instances are cited to shew that in studying susceptibility to disease, not only the environment and the possibility of the presence of different races of rust but also the stage of development of the plant must be taken into account.

The resistant forms obtained exceeded the yield of the variety Ukrainka by 50 per cent and are alleged to have other valuable economic characteristics.

819. Ma, P. C. and
Fan, F. R. 633.11–2.452–1.521.6
(Resistance of wheat to leaf rust, *Puccinia triticina*, Eriks).
J. Agric. Ass. China 1935 : No. 139 : 20–31.

In the first part of the paper (which is a general review of work on the subject) the symptoms of the disease and the life history of the pathogen are described. In the later part, the effects of the disease upon the yield, mode of inheritance of resistance and the methods of breeding resistant varieties are mentioned. T. C. C.

820. Pelshenke, P. 633.11:664.641.016:578.081
Die für den Züchter wichtigsten Methoden zur Prüfung der Backfähigkeit des Weizens. **(The most important methods for the breeder for testing the baking quality of wheat).**
Züchter 1938 : **10** : 6–9.

The various methods at the disposal of the breeder for testing the baking quality of the wheats are briefly considered.

When only a small quantity of material is available, as in the first generation, there are the micro methods that require 2–5 grms only. There are also a number of other indirect methods that can be used when selecting from the first few generations and finally the direct baking test can be made to confirm the results. Germination in the ear, though not directly connected with baking quality, considerably decreases the quality of the bread and resistance to this defect should not be neglected by the breeder.

The much discussed question of what should be the aim of the breeder for quality, gluten quantity or gluten quality, is briefly considered, as well as the possibility of breeding for higher maltose content.

821. Engelke, H. 633.11:664.641.016:578.081:575.11
Mikromethoden zur Bestimmung der Backqualität und ihre Bedeutung für die Züchtung. (**Micro-methods for the determination of baking quality and their importance for breeding**).
Landw. Jb. 1937 : **84** : 779–98.

The various indirect methods for the testing of baking quality, for which only a small quantity of material is required, have already improved the quality of German wheat as the wheats of poor quality can now be discarded at a much earlier stage.
The use of micro-methods still further shortens the time before which the wheat can be tested. Some of the experimental details of the Göttingen micro-method are then described (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 862), and finally the results are compared with those of other methods shewing that the micro-method is sufficiently accurate for the breeder. The results are given graphically of the baking quality of a number of F_2 progenies, from crosses between bad and good quality wheats. The recessive character good quality is clearly shewn but how many factors are concerned has still to be determined. It is also shewn that the micro-method can be satisfactorily used not only on individual plants of the F_2 and later generation but also on individual ears.
Experiments with land races and established varieties shew that there is no correlation between glume colour and baking quality and further that no difficulty is to be expected with regard to awns, germination in the ear or protein content when breeding for quality.

822. Sorokina, O. N. 633.11 *Aegilops*:576.16:575.127.2
(Contribution to the synthesis of *Aegilops* species).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 151–60.

Crosses were made between *Ae. caudata* and *Ae. umbellulata*, a set of a little over 10 per cent being obtained. The hybrid proved to be almost indistinguishable from the species *Ae. triuncialis*. It was however sterile and at metaphase I formed no more than 3–5 open bivalents, with corresponding abnormalities of meiosis. In chromosome morphology the hybrid resembled *Ae. persica* and not *Ae. triuncialis typica*. It is possible that it represents a form of *Ae. triuncialis* that exists but has not been investigated cytologically; or that since the original production of this species by hybridization it has altered in two different directions, genetically, producing *Ae. persica*, and karyotypically, producing *Ae. triuncialis typica*; or lastly that the two parental species have altered genically since the time when they crossed to produce *Ae. triuncialis* in nature.
Other authors who have artificially produced a species existing in nature are cited.

823. 633.12:575(47)
Nazartsev, N. 633.14:575(47)
(Results of the work of Dr I. A. Pullman in breeding buckwheat and rye).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 4 : 23–26.

The exceptionally large plants of buckwheat obtained by Dr Pullman, for which such claims were made as regards the production of a new variety with record yielding capacity, are held to be the result of growth in shady conditions, leading to partial etiolation, and not to be a hereditary character of the variety in question at all. Under ordinary conditions of cultivation Pullman's new varieties have proved inferior to existing standard types. Various other defects in Pullman's breeding methods are pointed out, e.g. neglect of the precautions necessary to prevent cross-fertilization, selection for unimportant characters such as flower colour rather than agronomic characters, and paucity of his initial breeding material. Buckwheat breeding on recognized lines for cross-fertilized crops is being started at the Šatilov station and it is hoped to get some more real improvement in the crop by this means.
In rye breeding Dr Pullman has devoted all his attention to the production of a yellow grained form, which has now been achieved; but none of his varieties have even equalled the recognized varieties in yield.

OATS 633.13

824. Zagorodnjuk, Ja. F. 633.13:575(47)
(A new variety of oats for arid regions).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 4 : 29–30.

Reference is made to an awnless early maturing oat variety 1365 6/28, selected by the Vernjač station and regarded as promising on account of its resistance to fungous diseases and very low attack by frit fly. In the last six years it has exceeded the varieties Lochow and Victory by 11–12 per cent in grain yield. It surpasses these varieties by about the same amount in yield of straw. Its grain is of good size, with a medium husk percentage.

825. Åkerman, Å. 633.13:575(48.5)
Havreförädling och havresorter. **(Oat breeding and oat varieties).**
Landtmannen Svenskt Land 1936 : No. 6 : 125–28.

A short account of the progress of breeding oats in Sweden and a description of the varieties grown.

826. Šostarič-Pisačié, K. 633.13:575"793"
Der Winterhafer. **(Winter oats).**
Wien. landw. Ztg. 1937 : **87** : No. 4 : 25–27.

The author describes the results of experiments carried out at the Agricultural Experiment Station, Zagreb. The performance of winter oats is compared with that of spring oats. In certain varieties definitely heritable differences were observed in the onset of flowering, lodging, length of straw, yield, etc. A. B.

827. Levine, M. N. and 633.13–2.452–1.521.6:568.081
Smith, D. C. 632.452:576.16(73)
Comparative reaction of oat varieties in the seedling and maturing stages to physiologic races of *Puccinia graminis avenae*, and the distribution of these races in the United States.
J. Agric. Res. 1937 : **55** : 713–29.

In all the cases studied, involving different races of the rust and different oat varieties, there was good agreement between seedling and mature plant reaction.
While races 1, 2, 5, 7 and 10 of *Puccinia graminis avenae* have been isolated at different times from collections made in various parts of the U.S.A., only races 2 and 5 are of economic importance and resistance to both these races is combined in several varieties.

RYE 633.14

828. Krasnjuk, A. 633.14:575.14
(Inbreeding in rye breeding).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 104–12.

The problem of freeing rye varieties from the defect of blind spikelets has not been solved by either mass or individual plant selection. By inbreeding, lines with 100 per cent fertility were obtained. On crossing these with a form of exceptionally low fertility, the F_1 obtained was fully fertile and in an F_2 of 352 plants 258 (or 73·3 per cent) were fertile and 94 (26·7 per cent) were of low fertility or completely sterile. It is therefore concluded that fertility is a simple dominant. It is thought that by suitable crossing between the fertile segregates it should be possible to produce a fertile line with desirable agronomic qualities and certain lines obtained by this means are already being multiplied. Some of them have exceeded the standard in yield by as much as 50 per cent in certain years, the grain being also plumper.

829. Šimon, J. 633.15:575(43.7)
Maisbau und Maissorten in der Tschechoslovakei. (**Maize and maize varieties in Czechoslovakia**).
Wien. landw. Ztg. 1937 : **87** : 155–57.
As a substitute for cereals and sugar beet maize is being extensively cultivated in Czechoslovakia and maize breeding is receiving special attention. A list and an account of the maize stations are given with observations on the most important varieties for particular purposes and for cultivation in various districts. A. B.

830. 633.15:575.11:581.45
Hadjinov, M. I. 633.15:575.242:575.115
(**Genes of "rough sheath" in maize: "rough sheath-1" and "rough sheath-2"**).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 247–58.
The first character, consisting of furrowed and irregularly formed leaf sheaths, and reduction in length of internodes and in yield, was found in one plant in a field of a variety of maize from Georgia. The second, consisting in a furrowing of the leaf and leaf sheaths and the formation of a number of thread-like supernumerary leaves together with frequent reduction in height and in yield, occurred in a wide cross between a Bolivian and a Turkmenian variety. Progeny of the first plant from open pollination were half normal and half rough, shewing the gene to be dominant; the same ratios (603 : 635) were obtained in crosses of the heterozygotes with normals.
The F_2 of the cross in which "rough sheath 2" (Rs_2) appeared shewed it to be a single recessive, which was confirmed by crosses of it with normals.
Rs_1 was found to be linked with lg_1, giving 44·84 ± 1·77 per cent crossing over in the backcross. It shewed no linkage with *B* and is assumed to be therefore at the other end of the chromosome. The gene is thought to be a dominant mutant of recent origin.

831. Hadjinov, M. I. 633.15:575.11:581.46
(**A new character in maize "*ramosa*-silkless" structure of inflorescence**).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 259–67.
The anomaly described consists in the formation of an unusually large number of male florets per spikelet, arranged alternately instead of oppositely; the female inflorescence is branched (resembling *ramosa*) and the florets are without ovaries, resembling those produced by the gene silkless. Crosses with representatives of these two types however shewed the gene in question to be distinct from either, its behaviour shewing it to be a single recessive *rl*, linked with *Bn* in chromosome VII. A provisional linkage value of 34·76 ± 2·55 per cent was determined in the F_2. No linkage with *ra* in the same chromosome was observed and *rl* is assumed to be at the opposite end.

832. Hadjinov, M. I. 633.15:575.11:581.49
(**New cases of ligulelessness in maize**).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 269–75.
Seven different liguleless forms of maize found independently in populations of different geographical origin are described. In each case the character was inherited as a simple recessive. All seven forms were crossed with Emerson's liguleless form and in every case proved to be identical with it. The phenotypic expression was the same except for one of the new forms, in which the ligule is not fully suppressed, especially in the upper leaves. The linkage of this new gene with *Bb* also corresponded with that for Emerson's gene *Lg lg* however and it is concluded that it is a modified form of the same gene.

833. Hadjinov, M. I. 633.15:575.11.061.5:581.45
(Genes of glossy seedlings in maize).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 227–46.
The character "glossy", which appeared in 30 per cent of the material examined, is described. Investigations on its inheritance have shewn nine different genes to be capable of producing the character in slightly varying degrees. A list of these is given, with the varieties in which it has been found. Some genes produce the glossy character throughout the life of the plant, others only in the more advanced stages, others again only in the early stages. Some affect only the waxiness of the leaves, others at the same time produce abnormal leaf growth and reduce fertility. In each case when only one of these genes was present clear monohybrid ratios were obtained.
Crosses between glossy plants of different types gave a normal F_1, crosses between glossy plants of the same type a glossy F_1. In the former crosses glossy appeared in the F_2 in the ratio 7 glossy : 9 normal. Double recessives segregating from these crosses were in no way different from the single recessives. Glossy 1 and 3 were shown to be identical with the genes of this name isolated by earlier investigators; gl_2 gave 18·8 per cent crossing-over with lg_1 and is assumed to be the same as the gl_2 of Hayes and Brewbaker, which gave 19·7 per cent. Other linkage studies indicated that gl_7 is linked with f_1 and gl_4 with *su*.
The different types differed in the frequency with which they occurred.

834. Bryan, A. A. and
Jugenheimer, R. W. 633.15:575.12(77·7)
Hybrid corn in Iowa.
Bull. Ia Agric. Exp. Sta. 1937 : No. 366 : 229–66.
After an account of the methods of producing hybrid maize, descriptions are given of the four double crosses which have been released by the Iowa Agricultural Experiment Station and of the inbred lines from which they are produced.

835. Bindloss, E. A. 633.15:575.12:576.312.1
Nuclear size in apical meristems of inbred and hybrid maize.
Amer. J. Bot. 1937 : **24** : p. 730.
Nuclear volume was measured in two inbred lines of maize P_1 and P_2 and in their reciprocal hybrids. In P_2, the less inbred line, nuclear volume was 40 per cent greater than in P_1. In hybrid P_1 x P_2 nuclear volume equalled or exceeded that of P_2; in P_2 x P_1 nuclear volume exceeded that of P_1 by 60 per cent and of P_2 by 13 per cent. These results are taken to suggest that nuclear volume is inherited and is influenced more by the female parent than by the male. Nuclear volume may be connected with heterosis.

836. Eyster, H. C. 633.15:575.242
Natural mutation rate in corn.
Genetics 1938 : **23** : p. 147. (Abst.)
The occurrence of 1·12 per cent of virescent, inviable seedlings in a commercial field of maize indicates that mutation in respect of this character is rather frequent.

837. McClintock, B. 633.15:575.242:576.356.2
A method for detecting potential mutations of a specific chromosomal region.
Genetics 1938 : **23** : p. 159. (Abst.)
Plants homozygous for a deficiency in chromosome 5 involving the locus of Bm_1, the normal allelomorph of *bm*, (brown midrib) and having in addition a small ring-shaped chromosome fragment covering the deficiency and carrying Bm_1 are mosaics of heterozygous and homozygous deficient tissues through frequent losses of the ring fragment during somatic mitoses. The homozygous deficient tissue is much reduced in growth capacity, contains no chloroplasts, has the characteristics of bm_1 in its cell walls and dries in sunlight.
Less frequently duplications or deficiencies of segments in the ring occur. The duplications produce no obvious tissue modifications but five types of "simple" mutant sectors have

been recognized and are ascribed to losses of specific regions of the ring. Five types of "compound" mutant sectors have also been noted; they combine the characters of more than one "simple" mutant and on the assumption that they are the product of losses of several adjacent regions of the ring, the order of the "simple" mutants in the chromosome is determined.
Since a homozygous deficiency for the Bm_1 locus produces the same effect as bm_1 (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1248) it is suggested that the other mutants may eventually appear as "genes" closely linked to bm_1.

838. Stadler, L. J. and
Uber, F. M. 633.15:575.243:535.61–31
Preliminary data on genetic effects of monochromatic ultra-violet radiation in maize.
Genetics 1938 : **23** : p. **171**. (Abst.)
Maize pollen was treated with monochromatic radiations with wave-lengths ranging from 235 mμ to 365 mμ. Within this range it was found that penetration does not vary widely with wave-length.
Tolerance (maximum dose permitting seed production) was $1{\cdot}2 \times 10^3$ ergs/mm² for λ235–240, $1{\cdot}2 \times 10^4$ ergs mm² for λ248–280, $1{\cdot}3 \times 10^5$ ergs mm² for λ297 and 302 and more than 10^6 ergs/mm² for λ313 and 365, at which the highest dose applied had no effect on seed production.
Deficiencies, marked by loss of endosperm genes, were induced in large numbers by all wave-lengths of the range 235–302 mμ. Longer wave-lengths had no appreciable effect on the frequency of deficiencies.
The frequency of germless seeds was increased markedly by radiations of wave-length 280 mμ and under but not by longer wave-lengths.
It thus appears that the three phenomena are the result of induced alterations which have distinctive spectral characteristics (Cf. Abst. 839).

839. Stadler, L. J. 633.15:575.243:535.61–31:537.531
On the possibility of disentangling by spectrological means the complex of genetic effects induced by radiations.
Genetics 1938 : **23** : 170–71. (Abst.)
It is pointed out that the frequency of translocations is increased by X-rays but not by ultra-violet light (Cf. "Plant Breeding Abstracts", Vol. VII, Absts. 980 and 981), while the ultra-violet effect on germless seeds and deficiencies have spectral characteristics (Cf. Abst. 838). Thus three of the four characteristic genetic effects of penetrating radiations on maize are spectrologically separable. The spectral correspondence of point mutation with deficiency and the germless seed effect remains to be determined.

840. Jones, D. F. 633.15:575.25
Variegation resulting from unequal mitosis.
Genetics 1938 : **23** : 153–54. (Abst.)
The substance of this paper has already been reviewed (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1245).

841. Cooper, D. C. and
Brink, R. A. 633.15:576.356.2:581.9
Chromosome homology in races of maize from different geographical regions.
Amer. Nat. 1937 : **71** : 582–87.
To see whether the great genetic diversity between varieties of maize cultivated in widely separated regions is accompanied by structural differences in their chromosomes, varieties of maize from Canada, Central America and South America were crossed with Wisconsin varieties and with strains known to be homozygous for certain translocations. The configurations observed at meiosis in the F_1 hybrids involving the Canadian and Central American varieties

and most of the South American varieties gave no evidence of such differences. In hybrids with Wisconsin varieties 10 bivalents were produced and in crosses with the translocation lines only the expected rings were observed.
In crosses involving two of the South American lines, their exact origin being unknown, there was apprently a diminution in chiasma frequency as compared with the other hybrids, leading to the production of chains instead of rings in the crosses with translocation lines. This, the authors state, may or may not indicate the presence of structural differences. In one cross with one of these lines, a supernumerary small univalent was observed.

842. RHOADES, M. M. 633.15:576.356.4
On the origin of a secondary trisome through the doubling of a half-chromosome fragment.
Genetics 1938 : **23** : 163–64. (Abst.)

Maize plants hyperploid for a chromosome fragment consisting of the entire short arm of chromosome 5 and with a terminal centromere, occasionally produce secondary trisomics in which the extra chromosome consists of two short arms of the fifth chromosome joined so as to have a median centromere. The frequency with which they appear is 0·42 per cent when the fragment plants are used as male parent and 0·22 per cent when the fragment plants are used as female parent.
The original fragment is transmitted with a very low frequency through the pollen and the secondary chromosome not at all. The problem therefore arises, how the percentages of secondary trisomics can be as great through the pollen as through the eggs. It is suggested that the secondary chromosome is produced at the first pollen grain division and that when the tube nucleus loses its supernumerary fragment and the generative nucleus gains it to form the secondary chromosome, the growth of the pollen tube might be normal but the male gametes would carry the secondary chromosome.

843. LINDSTROM, E. W. 633.15–1.547.2:575.182
Maternal influence in the heredity of tillering in maize.
Genetics 1938 : **23** : 156–57. (Abst.)

Evidence of a maternal effect on the inheritance of tillering is presented. It is suggested that tillering primordia of the embryo develop under some influence of the mother plant. A direct effect of seed or embryo size is not concerned.
The inheritance of tillering is controlled by multiple factors, complicated by climatic and nutritional effects as well as by the maternal effect.

844. 633.15–2.2–1.521.6
WELLHAUSEN, E. J. 633.2–2.3–1.521.6
Effect of the genetic constitution of the host on the virulence of *Phytomonas stewartii*.
Phytopathology 1937 : **27** : 1070–89.

Using seedlings of two inbred lines of maize it is shewn that successive passages of *Phytomonas stewarti* through the resistant strain "yellow-dent inbred" increase its virulence up to a certain point, whilst successive passages through the susceptible strain "Golden Bantam" decrease its virulence for maize to a certain value.
This is also so for a variety of teosinte, but when passed through highly resistant varieties of Reed canary grass, Timothy grass, etc., although the virulence is increased for these grasses it is decreased for maize.
The author discusses the theoretical problems involved in this type of variation, indicating its practical applications. J. G. H.

845. Meyers, M. T.,
Huber, L. L.,
Neiswander, C. R.,
Richey, F. D., and
Stringfield, G. H. 633.15–2.7–1.521.6:575.12
Experiments on breeding corn resistant to the European corn borer.
Tech. Bull. U.S. Dep. Agric. 1937 : No. 583 : Pp. 30.

Tabular data are given on experiments conducted during the years 1926–1932 inclusive, mainly in Ohio, in which the infestation of selfed lines, open-pollinated varieties and hybrids (including top-crosses), collectively referred to as "strains," was measured and correlated with other characteristics bearing chiefly on their earliness and lateness.

It was found that early maturing strains tend to be taller in early growth at the time of oviposition and so get more eggs; at the same time early maturing strains favour a higher survival value of larvae. An expected infestation was computed for each strain from the multiple regression of infestation on strain height at the time of oviposition and strain silking date and the difference between the observed and the expected infestation was taken as an indication of the inherent resistance or susceptibility of the strain. It is not considered safe to rely on the differences of infestation due mainly to plant height or earliness since they would presumably have little or no value when one strain was being grown over a large area. It is concluded that using lines from the less susceptible strains it should be possible to make up hybrids which would get only about 80 per cent of the infestation expected on open-pollinated varieties of similar seasonal requirements and which would at the same time be 10 to 20 per cent more productive.

No evidence of immunity or genetically simple resistance was found, even in the exotic strains like Amargo maize.

BARLEY 633.16

846. 633.16(42)
Bell, G. D. H. 633.16:581.48
The classification and identification of some two-row varieties of barley cultivated in Great Britain, including a description of the use of grain and vegetative characters for this purpose.
Z. Zücht. 1937 : A **22** : 81–146.

The first part of this paper deals with the identification of varieties by grain characters and a key based on these is given; not all varieties can be separated on grain characters alone. In the second part the characters to be observed in the field from the juvenile period to maturity are considered.

847. Göpp, K. 633.16:575(43)
Ziele und Ergebnisse in der Gerstenzüchtung.
(**Aims and results in barley breeding**).
Tagesztg. Brauerei 1937 : **35** : 445–46.

The present need in Germany for an increase in protein production makes the breeding of forage barleys with a high protein content combined with such other economic characters as standing capacity and disease-resistance an urgent problem.

The results of work in the direction are briefly reviewed as well as the methods used in the promotion of other objectives such as the breeding of a smooth awned variety, varieties without awns, a winter-hardy winter barley and finally forms suitable for the brewing industry.

848. 633.16:575(47)
635.656:575(47)
Ponomarev, N. 633.13:575(47)
(**New varieties of barley and peas for the north**).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1936 : No. 12 : 230–32.

Experiments on new varieties of barley produced by the northern agricultural research station are reported, the best of the new varieties exceeded the standard, Pioneer, by 32·5 per cent in yield, being only a few days later in maturity. The new varieties are also characterized

by standing capacity and resistance to *Ustilago nuda*. One variety of naked barley has exceeded Pioneer in yield; this variety is also higher in protein content.
Oats of improved standing capacity, excelling Kioto in yield by 8·1 per cent, have also been produced and peas superior to the excellent standard variety Irishman both in yield and earliness have been produced from the cross Waxy x Early June.

849. Sobotka, M. 633.16:575"793"(43.7)
(The spring barleys of Czechoslovakia—varieties direct from the breeder).
Die tschechoslovakischen Sommergersten—Originalsorten.
Wien. landw. Ztg. **1937** : **87** : No. 14 : p. 110.

In Czechoslovakia the breeding of barley has attained a high position. Above all excellent malting barley is bred and cultivated. Thirty-three concerns are engaged in breeding barley; the names of the most important are given, with a list of the varieties produced by breeders and their genetic origin. The varieties differ less in quality than in their requirements as regards soil and climate. Recently the naked spring barleys which have a high protein content have become important in Czechoslovakia for fodder. A. B.

850. Glinyany, N. P. 633.16:575.11:581.46
(Inheritance of awns and hoods in crosses between *Hordeum vulgare* var. *Nudihaxtoni* x *Hordeum vulgare* var. *trifurcatum*).
Bull. Appl. Bot. Leningrad **1937** : Ser. II (7) : **355–76.**

In a cross between the hooded barley *H. vulgare* var. *trifurcatum* and a normal form the F_1 was intermediate, the amount of hood development varying in different plants and in different ears. The F_2 was exceedingly complex, both awns and hoods being present in varying degrees, and sometimes both on the same ear, the lateral spikelets bearing short awns and the central spikelets hoods. On the basis of the F_2 classification and the F_3 behaviour nine genetically different groups were established. The ratio between the total hooded and awned was 3 : 1 and from the relationship between the other groups it is concluded that two factor pairs are operative, *A*, a dominant gene conditioning hoods on all spikelets, *n* an incompletely recessive gene conditioning awns on all spikelets in the absence of *A*; *a* produces awns on all spikelets, *N* favours the awns of the central spikelets and inhibits them on the lateral spikelets. Thus the combination *aann* produces awns on all spikelets, *aaNn* reduced awns on the lateral spikelets. Thus 948 F_2 plants were hooded and 297 awned and the distribution into the different groups was as follows: group I 72, II 71, III 154, IV 76, V 167, VI_3 630, and VII 75, group VI_3 being a composite group consisting of three genetically different but phenotypically indistinguishable groups; F_3 analysis of this group shewed it to be composed of 48 VI, 24 VIII and 19 IX group plants. The ratio of the different groups is thus 1:1:2:1:2:4:1:2:2, the groups corresponding to the following genetical formulae: I *aaNN*, II *aann*, III *aaNn*, IV *AAnn*, V *Aann*, VI *AaNn*, VII *AANN*, VIII *AnNN*, and IX *AANn*. These conclusions are being tested by intercrossing the different segregating groups.
Groups II and VII correspond exactly with the existing varieties *H. vulgare* var. *coeleste* L. and *H. vulgare* var. *cornutum* Körn respectively, and crosses are being made between them to find whether they are also genetically identical.
The work of other authors on the inheritance of hoods and awns is reviewed.

851. Ivanova, K. V. 633.16:575.116.1:581.46
(A new character in barley, "third outer glume"—its inheritance and linkage with colour of the flowering glumes).
Bull. Appl. Bot. Leningrad **1937** : Ser. II (7) : **339–53.**

An Afghan barley with a bract, or supplementary glume, covering the ordinary outer glumes, is described for the first time. In a series of crosses with the normal the character proved recessive, (*tt*) and monohybrid ratios were observed in the F_2 and F_3.
The dominance of black over yellow flowering glumes (*Bb*) was confirmed and in crosses where this and the gene *Tt* were present together a linkage was established between *T* and *B*, with an average cross-over of 16·49 per cent, confirmed in F_3 and back-cross material. With another gene of the same group, *Ll*, free or almost free combination occurred and no linkage was observed with any of the other genes studied.

852. Lutkov, A. N. 633.16:575.243:537.531
(Chlorophyll mutations and other types of hereditary variations in *Hordeum* induced by X-rays).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 209–25.
Descriptions are given of a number of anomalies occurring among the plants arising from seeds X-rayed during sprouting. These include narrow leaves, and various ear deformities, most of which were partially or entirely sterile. Reduced fertility was observed too in many of the plants which morphologically appeared quite normal. Most of these anomalies proved not to be inherited and the chromosomal behaviour of the plants was more or less normal. The following generation, however, contained various recessive mutants, mainly chlorophyll deficiencies, striping, etc.; these were more frequent in the progenies of X-rayed ears and still more in progenies of treated dry seeds, since these tolerate much larger doses of irradiation. The majority of the mutants were simple recessives. In addition there appeared a type with deformed ears somewhat resembling *intermedium* and with a tendency to branch and hence to produce more grains per ear and to be later in maturity. This form bred true and similar forms appeared in the later generations from other plants of the same family in a proportion indicating that the character is a single recessive. Another mutant appearing in the X_2 possessed spikelets devoid of lodicules, ovary and stamens; six such plants appeared in a family of 26 plants, some of them bearing occasional normal spikelets, which formed grains and gave progeny that reproduced the abnormality; it appeared in the later generation produced by some of the normal plants of the family, usually in the ratio one abnormal: three normal. Dwarf plants of similar genetic behaviour appeared in other families.
All the above mutants were karyologically quite normal and are thus clearly single recessive gene mutations.

853. Pismenko, P. A. 633.16:575.243:537.531
(Mutations in barley induced by X-rays).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 13–14 (21–22) : 95–108.
Mutants were obtained by the following treatments: irradiation of the ears before flowering; irradiation of seeds soaked in solutions of salts of heavy metals; irradiation of air-dry seeds. The dosages ranged from 500r to 4,000r. Some of the mutations affected adult characters.

854. Lutkov, A. N. 633.16:575.243:581.49:537.531
(Artificial induction of a liguleless form of barley by means of X-rays).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 197–202.
According to the law of homologous variations, liguleless forms have now been found in all cereals but barley and sorghum. In 1932, however, experiments on the effect of X-rays on germinating grains of an Abyssinian barley *H. distichum* var. *Steudeli* were started. Among 10,000 seedlings from the resulting plants, representing the progeny of 754 ears, there appeared in the progeny of one ear, which had received a dose of 600 *r*., a number of plants of the *eligulatum* type. One of the liguleless plants bred true for the character in later generations, the others segregated monofactorially.
These liguleless barleys differ from corresponding forms of most other cereals in having normally developed auricles.

855. Lutkov, A. N. 633.16:575.243"793":537.531
(Production of a winter form of *Hordeum* by X-ray treatment).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 203–08.
The Abyssinian barley *H. distichum* var. *Steudeli* Körn., maturing near Leningrad in as little as 74–86 days, was X-rayed in the ear stage, where a dose of twice as much could be tolerated as in the seedling stage—e.g. the sublethal dose for sprouted seeds was 1,200 *r* and for ears 2,500 *r*. The resulting plants were grown in the greenhouse and the X_2 sown the following year, the seed of 213 plants giving rise to 7,355 seedlings. In addition to a number of chlorophyll mutations one type was of interest in that it was a winter form; there were 8 such plants in one family, the remaining 18 plants being normal spring forms which were fully

ripe at the end of the season while the 8 mutants remained in the tillering stage. The ear initial remained undifferentiated throughout the winter.
The proportion of winter to spring plants in this and in later generations indicated that the winter form was due to a single recessive mutation, the gene *S* having mutated to *s*.

856. Müntzing, A., Tometorp, G. and Mundt-Petersen, K. 633.16:576.356.5:581.036.1
Tetraploid barley produced by heat treatment.
Hereditas, Lund 1936–37 : **22** : 401–06.
A grain of barley (variety Opal B) obtained from an ear which had been subject 18 hours after pollination for 30 minutes to a temperature of 45° C. gave rise to a plant which from its appearance was suspected to be a tetraploid. Eleven seedlings were raised from the suspected plant and their chromosome numbers determined from their root-tips. Four plants had $2n = 28$, four 27 and one 30 while in the remaining two no counts could be made. It is concluded that the suspected plant was in fact a tetraploid.

857. Hoffmann, W. 633.16–2.111–1.521.6:581.143.26.03:575
Die Winterfestigkeit keimgestimmter Gersten. (**The winter-hardiness of vernalized barley**).
Züchter 1937 : **9** : 281–84.
The investigation was made on five varieties of winter barley, one spring barley and four strains bred by the Kaiser Wilhelm Institut für Züchtungsforschung, two of which were alternative forms and two typical winter barleys. The grain was vernalized for periods of 20, 30 and 40 days and the results shewed that the effect of vernalization was to reduce considerably the winter-hardiness. This reduction was least in the most winter-hardy forms and it is suggested that the method may be a convenient and rapid test for the selection of the most winter-hardy types.

858. Briggs, F. N. 633.16–2.42–1.521.6:575.11
The inheritance of resistance to mildew.
Amer. Nat. 1938 : **72** : 34–41.
A report of genetical investigations on resistance to *Erysiphe graminis hordei*, Form 3, of the resistant varieties Arlington Awnless, Chinerme and Nigrate. These varieties all belong to *Hordeum intermedium* and Chinerme and Nigrate are very similar, the latter being a selection from the former, which is of Chinese origin.
In crosses of these three varieties with the susceptible Atlas, segregation into 15 resistant : 1 susceptible was observed in each case in F_2, shewing that they each differ from Atlas by two independent major factors for resistance. This was confirmed by the F_3 segregation. Hanna (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 557) and Goldfoil each differ from Atlas by one major factor for resistance. Crosses of Arlington Awnless, Chinerme and Nigrate with these two varieties gave F_2 segregations of 63 resistant : 1 susceptible. When Arlington Awnless, Chinerme and Nigrate were crossed among themselves no susceptible plants were obtained in F_2. It therefore appears that these three varieties carry the same two factors for resistance but that neither of the factors is the same as the Hanna or Goldfoil factors, which are known to be different from each other.

859. Thren, R. 633.16–2.451.2–1.521.6:578.08
Kritische Versuche zur Resistenzprüfung der Gerste gegen Flugbrand (*Ustilago nuda* [Jens.] Kellerm. et Sw.). [**Critical experiments on the testing for resistance of barley to loose smut** (***U. nuda*** [**Jens.**] **Kellerm. et Sw.**)].
Kühn-Arch. 1937 : **44** : 211–31.
The experiments were made on the two methods of testing for infection used during the last 15 years at the Institut für Pflanzenbau und -züchtung at Halle. The methods are critically examined and a number of suggestions are made for their improvement.

860. 633.16–2.452–1.521.6:575
STRAIB, W. 633.16–2.42–1.521.6:575
Über Resistenz bei Gerste gegenüber Zwergrost und Gelbrost. (**On the resistance of barley to dwarf rust and yellow rust**).
Züchter 1937 : **9** : 305–11.

Dwarf rust, *Puccinia simplex*, is found on both spring and winter barley all the year round and almost everywhere in Germany. Yellow rust, *P. glumarum*, has only recently become a serious menace to barley and attacks, on the whole, only a few varieties.

The damage caused by both forms of rust to the quality and yield, is considerable and breeding resistant varieties offers the best method of control. *P. simplex* over-winters in the uredo-spore stage on winter barley. Seventeen of the nineteen known races of dwarf rust have been found in Germany. Only two physiological races of yellow rust, 23 and 24 need to be seriously considered. The results of tests of 508 varieties of barley, 470 spring and 38 winter varieties, shewed that only very few varieties possess resistance to all the races of dwarf rust tested. Those that were resistant, however, were also resistant to yellow rust. Such were Bolivia, Quin, Palästina and Spanische.

It is of interest, for the selecting of parents, to note that among the resistant forms all the three main species of barley are to be found.

No markedly resistant winter barley variety was found.

Differences in behaviour are noted between resistance in the greenhouse and in the field. Resistance to barley mildew, *Erysiphe graminis hordei* is, like that of dwarf rust, conditioned by a single pair of Mendelian factors and the combination should present no difficulties.

MILLETS AND SORGHUMS 633.17

861. KRISHNASWAMY, N. and 633.171:581.3:576.312
RANGASWAMI AYYANGAR, G. N. 633.171:576.312.35
Cytological studies in *Eleusine coracana* (Gaertn.). Ragi—the finger millet.
Beih. bot. Zbl. 1937 : **57** : 297–318.

The general cytology of the plant was studied. The number of somatic chromosomes was 36. Details are given of the development of the panicle and of the floral organs, and microsporogenesis, the pollen grain, megasporogenesis and embryogeny are described.

862. KANG, S. G. 633.171–1.557
(**The analysis of yield factors in millet**).
J. Agric. Ass. China 1936 : No. 152 : 1–16.

Twenty-five varieties of millet were tested for their yield factors. The simple coefficients of correlation between yield and weight of root, weight of straw, number of branches on the main spike and the weight of one hundred grains were ·5235, ·6238, ·8091 and ·5434 respectively. The values of the partial correlation for the last three were ·5274, ·6497 and ·9078 respectively, instead of ·6238, ·8091 and ·5434. No significant correlation was found between yield and height of straw, number of tillers, weight of leaves and the circumference of the spike, but they were not completely unrelated to yield, as they were indirectly correlated with other factors affecting yield. T. C. C.

863. HILL, A. F. 633.174:00.14(73)
The nomenclature of the cultivated sorghums.
Bot. Mus. Leafl. Harv. 1937 : **4** : 173–80.

The Latin names of the sorghums cultivated in the United States are given. Though based on Snowden's work, the American custom of treating all except the grass sorghums as varieties of *Sorghum vulgare* Pers. is followed.

864. HADJINOV, M. I. 633.174:581.162.5:575.127

[Sterility in varietal hybrids of sorghum (Preliminary communication).]

Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 417–46.

The hybrids of two forms exhibiting the characters waxy endosperm and variegated leaf respectively with Indian sorghums, though normally developed vegetatively, proved to be quite sterile, producing only a few dozen grains from several thousand florets. On crossing the waxy endosperm form with the variegated form hybrids of normal fertility were obtained, shewing that the sterility was carried by the Indian forms, which are described. One of these varieties, Falfaria, was crossed with a number of other forms of different geographical origin. The F_1 in every case was normally developed, some F_1s shewing heterosis. However among 182 F_1 plants only 9 were fertile, and the other 173 formed no grain whatever; of the nine fertile plants eight were entirely maternal and thought to be accidental selfs and the other was an accidental hybrid with a form other than Falfaria. There was no difference between the reciprocal hybrids.

The pollen of the sterile hybrids shewed a high degree of sterility, from 91·3 to 100 per cent, and the anthers did not dehisce. Pollination with mixed pollen from other varieties without emasculation gave a set of not more than 7–12 per cent. Yet meiosis in the sterile hybrids was normal, with the usual 10 bivalents, and tetrad formation also proceeded normally. Degeneration began just before the first division of the pollen nucleus, starting first in the plasma and passing later to the nucleus.

A certain degree of sterility was also noted in the parental line Falfaria but not enough to account for the complete sterility of the hybrids, which was moreover not affected by the greater or lesser sterility of the parental form. Similar phenomena were observed in a number of other sorghums of the same geographical origin.

The sterile hybrids on being pollinated with the normal parent yielded a back-cross progeny of 95 plants, of which 89 were quite sterile and the other six partially so, with a sterility varying between 70 and 100 per cent. One plant was unusual in having a high fertility of the egg cells though the pollen was sterile. The back-cross hybrids were further back-crossed with the normal parent and the third generation so obtained still displayed an uncommonly low fertility as did the F_2 generation obtained by selfing. In the fourth generation there was a definite reduction in sterility, although some lines still remained highly infertile.

The resemblance between this type of sterility and that characteristic of wide crosses is pointed out and the author leans toward the view that the Indian group in question, representatives of which are fertile among themselves, is becoming differentiated into a separate subspecies.

865. 633.174–2.7–1.521.6

HSU, T. S. 633.62–2.7–1.521.6

[A preliminary study of the resistance to stem borer (*Pyrausta nubilalis*, Hubn.) of kaoliang.]

J. Agric. Ass. China 1935 : No. 132 : 63–92.

The life history of *Pyrausta nubilalis*, Hubn., one of the several species concerned, includes two and a partial third generation per annum. The resistance of varieties to the insect and the relationship between resistance and the morphological characters of the sorghum varieties were studied. Resistance was determined in the field and in cage tests.

The author had been led to the belief from investigations made in 1933 and 1934 that resistance to the insect did exist in certain varieties and was due probably to genetic factors.

Under controlled or cage conditions, the sweet sorghums as a group were more susceptible to the insect. Local varieties were subject to slighter infestation, and the author concluded that the difference was due to host selection by the insect.

Regarding the relationship between the resistance and the morphological characters, the author found that the white-grained and the short-stalked varieties were relatively resistant and there might be linkage between the resistance and the characters mentioned. T. C. C.

866. Sampietro, G. 633.18(45)
Nuove varietà di riso. (New varieties of rice).
G. Risicolt. 1937 : **27** : 161–66.

Five new varieties of rice are briefly described. Three were obtained by artificial hybridization—varieties 10 and 11 from the cross Mantova x Vialone; Var. 12 from the cross Nano x Vialone; Var. 13 is a natural hybrid from the variety Viola and Var. 14 has been acclimatized from the Japanese variety Kameno.

867. Morinaga, T. and Fukushima, E. 633.18:575.242:576.356.5
Cyto-genetical studies on *Oryza sativa* L. III. Spontaneous autotetraploid mutants in *Oryza sativa* L.
Jap. J. Bot. 1937 : **9** : 71–94.

Several lines of autotetraploid plants have been observed to arise spontaneously from highly sterile diploid strains. These shew typical *gigas* form, differing from the autotriploid in the stumpiness of the whole plant, short panicle stalks and very long awns. It is considered that they may have arisen by somatic chromosome doubling either in the pro-embryo or in later meristems, and experiments are quoted shewing that heat treatment may produce similar effects.

Sterility varies from 94–65 per cent whilst a fairly high percentage of seed fails to germinate. The percentage of parthenocarpic ovaries also varies in different lines.

Chromosome behaviour during meiosis is essentially the same in micro- and megasporogenesis. The four homologous chromosomes conjugate as a quadrivalent or two bivalents, the average number of quadrivalents per nucleus being 8·66. All the nuclear and cell division processes are regular, but although the majority of spores contain 24 chromosomes about 50 per cent of the micro- and 40 per cent of the megaspores fail to develop. Embryo sac development is quite normal in the majority of cases. J. G. H.

868. 633.18:576.312.32:576.312.315
Nandi, H. K. 633.18:576.356.5
Cytological investigations of rice varieties.
Cytologia, Tokyo 1937 : **8** : 277–305.

The paper gives a detailed description of the cytology of seven varieties of rice. These are very similar in most respects, differing chiefly in nucleolar behaviour.

Observations on the volume of the nucleolus during meiosis compared with that of the chromosomes leads the author to the conclusion that the nucleolus contributes "matric substance" to the post diakinetic chromosomes. The nucleolus is then reorganised from this substance at telophase.

Various abnormalities described in pollen maturation show how triploids and tetraploids may arise. J. G. H.

869. Shen, H. N. 633.18:581.466
(A study of polygynous rice).
J. Agric. Ass. China 1933 : No. 115 : 89–97.

Polygynous starchy rice grains were obtained from Szechuan. The majority of them possessed two protective glumes, while the minority possessed one which was as long as the palea, instead of or in addition to the small glume between the rachis and the palea. The number and size of grains within the paleae varied. In fruits composed of two grains, the latter were either of equal size or one of them was very much reduced. Where three grains were formed they either developed to approximately the same size, or the middle one was flattened due to the pressure of the two lateral crescent shaped ones. Most of the fruits gave rise to only one plumule, but some gave rise to two, in which case either both plumules developed simultaneously or else one of them proved incapable of further development. Amongst the grains with three plumules, only two or even one of the three survived. Some of the fruits failed

entirely to germinate, and this together with the abnormal development of the plumules is ascribed to the under-development of the endosperms of the grains concerned.
The number of tillers varied from three to five with an average of four. Between the second and fourth node branches were often found on which the panicle matured about two to three weeks later than on the main stalk. The upper surface of the leaf was pubescent and the culm and the leaf-sheath were crimson. Each spikelet contained six stamens, and the number of pistils varied from three to nine. Each pistil had one ovary, one style, and two stigmas. The percentage of sterility of the flowers varied from twenty to thirty and was increased when the plants were grown in the greenhouse.
No cytogenetic studies have been made. T. C. C.

870. Ryker, T. C. 633.18–2.484–1.521.6:575
The problem of breeding rice for resistance to *Cercospora oryzae*.
Phytopathology 1938 : **28** : p. 19. (Abst.)
Blue Rose and Early Prolific, which occupy about 75 per cent of the rice acreage of Louisiana, are susceptible to *Cercospora* leaf spot though Early Prolific usually escapes serious injury because of its earliness. Rexora and Fortuna are highly resistant but tend to become susceptible when maturing. A study of the inheritance of resistance is complicated by the gradation in resistance in different plants and its variability in the same plant at different stages of maturity.
A method of inoculation has been employed in selecting for resistance and several selections from Blue Rose appeared to be resistant when tested in the field.

871. Tsai, P. H. and
Yang, H. L. 633.18–2.7–1.521.6
(An investigation of the resistance of rice to rice-borer injury).
J. Agric. Ass. China 1933 : No. 118 : 33–60.
The investigation which was made during 1929–32 included 32 early, 14 medium early, 24 glutinous types and 66 late varieties of rice. In regard to the resistance, intervarietal differences were found, the majority being due to the discrepancy between the stages of growth in varieties with different dates of maturity, on the one hand, and the life cycles of the insect, on the other. None of the varieties tested were absolutely free from infestation; and inherent resistance is rare.
Amongst the early varieties, the relationship between the date of maturity and the degree of infestation varied according to the years, e.g. in 1930, early varieties shewed heavier infestation while in 1932, no such relationship was found. The medium varieties gave no correlation between the date of maturity and the degree of infestation. Among the late varieties slighter infestation was found for the comparatively later ones in 1930, and all those which eared after the first of September escaped attack.
Finally, the authors mention twenty-two varieties shewing relatively slight infestation of which nine possessed higher yielding capacity. T. C. C.

HERBACEOUS FORAGE PLANTS 633.2

872. Kiellander, C. L. 633.21:576.356.5:581.163
On the embryological basis of apomixis in *Poa palustris* L.
Svensk Bot. Tidskr. 1937 : **31** : 425–29.
Poa palustris L. is a partial apomictic in that haploid egg cells are often produced, though in a much lower proportion to unreduced eggs. Pollination from the same or different species is found to induce apomictic seed formation. In one experiment a few weak undersized seedlings were produced, believed to be haploid. J. G. H.

LEGUMINOUS FORAGE PLANTS 633.3

873. Romanenko, V. 633.3:576.312.35
(A cyto-embryological study of certain leguminous fodder plants).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 11 (19) : 3–39.
The following haploid chromosome numbers were found: *Medicago sativa* L., 16; *Coronilla varia* L., 12; *Ornithopus sativa* Link., 7; *Onobrychis sativa* Lam., 14.

874. Fleischmann, R. 633.311–2.7–1.521.6:575
Die Gallenfliegen, eine Gefahr für die Luzernesamenerzeugung. (**The gall midges, a danger to lucerne production**).
Wien. landw. Ztg. 1937 : **87** : No. 39 : 310–12.
An account is given of the damage caused by this pest to lucerne seed. Of particular interest are the author's remarks on the possibility of breeding varieties resistant to the midge. A. B.

875. Fischer, A. 633.367:575
Die Züchtung und die Bedeutung bitterstofffreier Lupinen in ausserdeutschen Ländern. (**The breeding and importance of alkaloid-free lupins in countries other than Germany**).
Züchter 1938 : **10** : 1–6.
The breeding of sweet lupins, first accomplished by German workers, has aroused interest in other parts of the world and the perfection in Russia of a method for the rapid detection of alkaloid in lupin seed led to the creation, independently, of strains of sweet lupin (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 1030) in that country. In other countries such as Czechoslovakia, Sweden and Poland the breeding and selection of sweet lupins is being taken up. The value of lupins as a fodder plant and as a source of protein and the fact that they can be grown readily on light soils makes the question of sweet lupin breeding a matter of importance in many countries.

876. Bier, A. 633.367:576.16
Weitere Mitteilungen über Transmutationen. (**Further notes on transmutation**).
Züchter 1938 : **10** : 14–18.
Further experiments are recorded (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 388) on the transmutation of lupin species. Besides the occurrence of plants with characteristics of *L. angustifolius* and *L. polyphyllus* from seed of *L. luteus*, seeds with a coloration not seen before were noted.
The phenomena are held not to be due to aging of the seed as in Navashin's experiments as the lupin seed used, though 50–60 years old is perfectly sound and gives 100 per cent germination. It is also extremely resistant to fungus disease even when grown on infected filter paper with normal seeds which were readily infected.

ROOTS AND TUBERS 633.4

877. Barducci, T. B. 633.491:575
El mejoramiento de la papa. (**The improvement of the potato**).
Bol. Direcc. Agric. Ganad. Colon. 1937 : **7** : Nos. 24–25 : 1–29.
A summary of our knowledge of the wild and cultivated potatoes of South America embodying the results of Juzepczuk, Bukasov, Vavilov, Rybin, Voskressenskaya, Salaman, Baur and others, reviews of which have already appeared in "Plant Breeding Abstracts". Notes on taxonomy, cytology, life cycles, breeding technique, disease and frost resistance etc. are included. J. G. H.

878. Clark, C. F. 633.491:575
Recent developments in potato breeding: review of literature.
Amer. Potato J. 1938 : **15** : 16–26.
This annual survey is partly based on the abstracts published by this Bureau and covers classification, genetics, cytology, disease resistance, frost resistance and miscellaneous topics.

879. Stevenson, F. J.,
Clark, C. F. and co-operators. 633.491:575(73)
The National Potato Breeding Program, 1936.
U.S. Dep. Agric., Bur. Pl. Ind. Pp. 27. (Mimeographed.)

Reports on the breeding work in 1936 from 21 states are given; still other states co-operate in this national effort by testing the newly produced varieties.

The breeding methods used comprise hybridization, including a few interspecific crosses, and also inbreeding, with studies on the best utilization of inbred lines. The characters considered include market and cooking quality, yield, seasonal requirements, resistance to extreme heat or cold and to insect pests and to diseases. The diseases include late blight, common scab, virus diseases (e.g. mild mosaic, latent mosaic, leaf roll, spindle tuber) and *Fusarium* diseases.

Close co-operation is maintained throughout, an interesting feature being the distribution of true seed from Presque Isle, Maine, for instance, to other states.

880. Stevenson, F. J.,
Schultz, E. S.,
Clark, C. F.,
Cash, L. and
Bonde, R. 633.491–2.411.4–1.521.6
Breeding for resistance to late blight in the potato.
Phytopathology 1937 : **27** : 1059–70.

Owing to the severe epidemics of late blight (*Phytophthora infestans*) that have occurred in all best potato growing districts of the United States, interest in the breeding of resistant varieties has greatly increased in recent years.

Resistant varieties previously introduced have proved unpopular owing to their poor yield, bad tuber shape, etc. Certain of these together with some susceptible strains have been used as the basis for the present experiments.

Certain progenies of crosses between two resistant varieties are all resistant. A comparatively large number of seedlings produced from seed sent from Germany have escaped infection for three years.

Resistance (especially in the German progenies) is often not associated with other desirable qualities. Several seedlings however, notably one produced from the two susceptible varieties Chippewa and Katahdin shew that this assumption is not universally correct, for they surpass such strains as Green Mountain in yield.

The results of the experiments indicate that late blight resistance in cultivated varieties is inherited as a recessive character controlled by mutiple genes, thus differing from *Solanum demissum* (a wild species) where immunity is probably inherited as a dominant character.

J. G. H.

881. Jones, L. K. and Burk, E. F. 633.491–2.8–1.521.6:575.11
The resistance of Katahdin potato seedlings to infection by the veinbanding virus and the tobacco mosaic virus.
Phytopathology 1938 : **28** : p. 11. (Abst.)

Seedlings produced by selfing Katahdin carried considerable resistance to the veinbanding virus, their symptoms varying from mottling to severe necrosis. The cross 200–5 (Early Northern x McCormick) produced very susceptible seedlings whose response was mottling without necrosis. A 200–5 x Katahdin cross produced seedlings with less resistance than Katahdin selfed seedlings but with a slightly greater tendency towards necrosis in affected plants.

Katahdin selfed seedlings were immune to common tobacco mosaic and 200–5 seedlings were somewhat susceptible, their symptoms varying from severe necrosis to mottling without necrosis.

882. Jones, H. A. 633.491.00.15:007(73)
Outline of current research on potatoes and list of workers.
U.S. Dep. Agric., Bur. Pl. Ind., Division of Fruit and Vegetable Crops and Diseases, Washington, January 1937 : Pp. 7. (Mimeographed.)
This publication, which it is intended to revise annually, gives a list of the topics, connected with potatoes, on which research is in progress in the U.S.A. and of the workers concerned.

FIBRES 633.5

883. Konstantinov, N. N. 633.51:575.127.2
On some interspecific crossings in the genus *Gossypium*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : **17** : 485–88.
Using *G. lanceoeforme* Miers. (*Thurberia thespesioides* Asa Gray) as the male parent crosses were made with the following varieties as female parent:—*G. barbadense* (4.4) *G. peruvianum* (1·8) *G. hirsutum* (4·3) and *G. arboreum* (8·5). The numbers in brackets are the percentage of bolls obtained. Differences were noted between the particular variety, race or line of the species used, some being more successful than others. All the bolls were abnormal in development and the seeds germinate with difficulty.
The characteristics of the F_1 progeny of the crosses are briefly described. Of the three different strains of *G. hirsutum* used only the progeny from one survived beyond the first season. This hybrid though somewhat retarded in growth was more or less normal.
From the results it is concluded that the species *Thurberia thespesioides* should be included in the genus *Gossypium*.

884. Wang, H. T. 633.51:575.42(51)
(Discussion of cotton experiment methods).
J. Agric. Ass. China 1933 : No. 116 : 47–56.
The author formulated a programme for cotton breeding, in which it was suggested that boll selection should be practised for both American and Chinese cotton varieties. Genetic purification should take place, according to the author, in the first three years. The first year should be devoted to field observation only, while for the second year replications should be planted with no standard variety as control and the yield data analysed by Richey's moving average method. For the third year randomized blocks, and for the fourth year the same method or the Latin square arrangement should be employed. Detailed procedures for the analysis of variance as well as the moving average method are presented. T. C. C.

885. Myers, W. M. 633.52–2.452–1.521.6:575.113.3
The nature and interaction of genes conditioning reaction to rust in flax.
J. Agric. Res. 1937 : **55** : 631–66.
The reactions of seventeen strains and varieties of flax to two different forms of rust (physiological form 4 and a collection) were used to show the interaction of genes in controlling susceptibility and immunity.
The varieties and hybrids were grown under glass and in the field and classed into the following groups according to the degree of attack by the rust collection (1) Immune, (2) Near immune, (3) Resistant, (4) Semi-resistant, (5) Moderately susceptible, (6) Susceptible. Immunity was dominant to the nearly immune condition, resistance and susceptibility, whilst resistance is dominant to all these except immunity.
In the crosses immunity in Ottawa 770B, Newland, C.I.438, C.I.416–3 and C.I.712 was explained by assuming duplicate factors *L* and *M* in two different allelomorphic series. The factors l^n and m^n condition the nearly immune type, and the factors l^r and m^r resistance. Crosses with the variety Long x E shewed that it probably carried l^n and m^n factors, whilst in Light Mauve and Bolley Golden a single major factor seems to condition resistance. It is not however an allelomorph of *L*. In the immune strain of Bolley Golden two factors condition immunity and resistance respectively.
The reactions of the parents to physiological form 4 was approximately similar to the reactions exhibited towards the collection. J. G. H.

886. Breslavec, L. P. and
Zaurov, E. 633.522:577.831
A study of hermaphrodite hemp found in field crops.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : **16** : 285–88.
A cytological study of the hermaphrodite forms of Italian hemp shewed these forms were generally monoecious but all stages in the transition from unisexual flowers to hermaphrodite were observed.

887. Gehelsen, C. A. 633.526.5
Notas preliminares sobre a germinação das sementes de caroá. (**Preliminary notes on the germination of caroa seeds**).
Bol. Minist. Agric. Rio de J. 1937 : **26** : 21–25.
Caroa (*Neoglaziova variegata*) grows wild in arid parts of Brazil and is a promising source of fibre as a substitute for jute. Difficulties encountered in germinating the seed were overcome by treating them with warm water at a temperature of 80° C.

SUGAR PLANTS 633.6

888. Ma, P. C. and
Fan, F. R. 633.61:575
(Sugar cane breeding).
J. Agric. Ass. China 1935 : No. 136 : 15–37.
The literature of sugar cane breeding is reviewed. The purpose of breeding, effect of mass selection, bud mutation, bud selection and the possible induced mutations obtainable by irradiation are fully described.
The morphology and the physiology of the flower, the methods of ensuring natural hybridization and self-pollination are treated in detail together with the technique of artificial hybridization. Methods of harvesting, storage and germination of seeds, procedures in comparative tests and the criteria in selection are presented.
Finally, the effects of intergeneric and interspecific crosses obtained by previous authors, and the successful examples of the introduction of seeds in various countries are outlined. T. C. C.

889. Lanuza, E. A. and 633.61:575(91.4)
Manas y Cruz, M. 633.61 Alunan
The Alunan cane in the sugar industry of Negros.
Philipp. J. Agric. 1937 : **8** : 311–26.
Data are given on the performance and popularity of the sugar cane variety Alunan, which was bred at the Granja Sugar Cane Station, La Carlota, from a cross between Java 247 and Badila and was originally known as La Carlota 25/191.

890. 633.61:575.127.2
Jeswiet, J. 633.61–2.8–1.521.6
Kruisingsresultaten met *Saccharum*soorten voor de Java-cultuur. (**Results of crosses with species of *Saccharum* for cultivation in Java**).
Erfelijkheid in Praktijk, Leiden 1937 : **2** : 53–54.
The substance of this survey of the author's research on species and varieties of *Saccharum* has been summarized in "Plant Breeding Abstracts" in the numerous reviews of his work and of that of Posthumus, Rümke and Bremer.

891. Santos, J. K. 633.61:576.312.35:576.354.5
Microsporogenesis of *Saccharum spontaneum* with special reference to its chromosome number.
Cytologia, Tokyo 1937 : **8** : 220–40.
A description is given of meiotic division, which is perfectly regular, interpreting the results on the telosynaptic theory of chromosome behaviour.
The haploid number is 40. The form investigated is the Philippine type, *S. spontaneum* subspecies *indicum* Häckel, locally known as talahib, bugang or lidda.

892. Simon, E. C. 633.61–1.557:575(76.3)
The effect of new sugar cane varieties on the Louisiana sugar industry.
Sug. Bull. N.O. 1937 : **15** : No. 20 : 6–7.
The increase in Louisiana sugar production resulting from the introduction of new varieties in place of the old noble canes is illustrated in tabular form. From a sugar production of 47,166 short tons in 1926 the P.O.J. canes 213, 234, 36 and 36M caused an increase to 199,609 short tons in 1929. A slight decrease occurred in 1930 and 1931 owing to the replacement of P.O.J. 213 by the lower yielding variety P.O.J. 234, P.O.J. 213 having proved susceptible to red rot. Increased plantings of Co. 281 and C.P. 807 in 1932 and 1933 led to a further increase to over 200,000 short tons and in 1934 and 1935 a rapid expansion of Co. 281 and Co. 290, replacing P.O.J. canes and to a certain extent C.P. 807, increased production to 333,000 short tons. In 1936 the production was 383,514 short tons; the expansion of Co. 281 and Co. 290 continued, these varieties together occupying more than half the acreage under sugar cane. The C.P. varieties 28-19, 28-11 and 29-320 became field varieties, occupying about 17 per cent of the acreage while C.P. 807 diminished, having shewn susceptibility to red rot. By this date the old noble canes had practically disappeared and the P.O.J. canes diminished from 54 per cent of the acreage in 1935 to 14 per cent in 1936
Another table gives data on the performance of the newer varieties in variety tests at the Louisiana Sugar Experiment Station.

893. Böse, A. 633.63:519.24(43.7)
Statistisch-korrelative Untersuchungen über die gegenseitigen Beziehungen der Eigenschaften der Zuckerrübe auf Grund der Berichte über deren Entwicklungsgang in der Čechoslovakei. (**Statistical-correlative investigations on the reciprocal relations of the characters of the sugar beet on the basis of the reports on their course of development in Tschecoslovakia**).
Ber. Forsch. Inst. čsl. Zuckerindustr. 1937 : **40** : 47–68.
Based on the results of investigations extending over a period of 10 years and including 100 beet sugar factories, the conclusions are as follows:—
There was a very clearly defined positive relation between the weight of leaves and roots which was about equally great for all periods of growth.
With regard to the relation between leaf-weight and sugar content, this is negative during the growth of the sugar beet but immediately before harvest it falls considerably. Though, therefore, a high leaf-weight shortly before harvest does not affect the sugar content of the root, the relation already established between leaf and root weight means that a low leaf weight implies a low quantity of sugar, as root weight has a much greater influence on the sugar yield than sugar content. There was a clear positive relation between leaf weight and grammes of sugar in the root.
The relation between leaf weight and sugar content differed at different periods of growth. It was demonstrated, by means of the method of partial correlation, that the relation between leaf and root weight remains positive and very considerable. Also the partial correlation between leaf weight and sugar content differs only slightly from the total correlations. The partial correlation of root weight with sugar content with constant leaf weight differs considerably from the total correlation, as instead of a negative relation at all periods of growth a positive partial correlation was obtained.

894. Savitsky, V. F. 633.63:575:581.192
(Study on the sugar content and yielding capacity of sugar beet hybrids).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1936 : **13** : Nos. 5–6 : 111–21.
Tabulated data from numerous crosses shew that on crossing races of sugar beet with relatively high and low sugar contents the sugar percentage of the F_1 in most cases is nearer to the arithmetical mean for the parents than to the individual parents and the high content of

the superior parent seldom appears in the F_1. Parallel tests made at two centres for all the crosses demonstrated the effect of environment upon the expression of the genotype and this interrelationship is especially emphasized. The occurrence of heterosis in the F_1 hybrids under certain local conditions, but not under others, is recorded—a finding regarded as of importance in the regionalization of varieties.

Owing to the very great variability of yield (i.e. root weight) among parent beets and their hybrids and to the complexity of this character, there were not sufficient data for its study; but crosses of 5 strains with 17 other varieties shewed that on the average the highest yields were obtained with beets from hybrids derived from crosses of higher yielding parents. A list of hybrids that exceeded the standard beet of the Uladovsk Station by 10 per cent is given. This does not, however, mean that high yields cannot be obtained from combinations of relatively low yielding forms as was shewn by the root weight of the hybrids obtained by crossing the Ivanov Station beet 29–16 with numerous other varieties. Moreover, it must be remembered none of the material here studied had been derived from inbred strains.

895. Savitsky, V. F. 633.63:575.127:633.41
(Hybridization between sugar beet and forage beet).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 4 : 31–34.

The F_1 of crosses between sugar and forage beets is low in sugar content, being generally intermediate between the parents. Figures are given shewing that the same is true of crosses between other types, such as sugar x semi-sugar, forage x semi-sugar etc. Hybrids from one and the same clone of sugar beet pollinated by different parents varied in sugar content from 10·0 to 15·0 per cent and in root weight from 300 to 550 grm.; the root weight was in certain crosses greater than either parent but sugar content never even equalled in the hybrids that of the sugar beet parent in crosses with other forms; hybrids surpassing the better parent occurred occasionally in crosses between different forms of sugar beet.

Sugar beet is less responsive to manurial treatment than forage beet and in this respect again the hybrids tended to be intermediate.

The proportion of F_2 segregates of the sugar beet type varied in different combinations from 25·0 to 0·25 per cent, being lowest in the crosses with forage beets. Similarly in the F_3. In practice it is not therefore practicable to select from F_2 and F_3 populations and the method preferred is that of repeated back-crossing with the sugar beet. After two or three back-crosses at least 50 per cent of the progeny equal or approach the sugar beet in their sugar content. Some of the segregates have been found to contain up to 25 per cent less salts and nitrogen and are in this respect regarded as extremely promising.

Further aims of the hybridization work are the production of a sugar beet with rounded roots and forms with the root partially above the ground.

896. Kharetshko-Savitskaya, H. I. 633.63:581.162.5
(Method of sterility analysis and producing of varieties of high-auto-fertility).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1936 : **13** : Nos. 5–6 : 122–37.

A considerable part of this paper, which opens with general considerations on sterility and fertility, has already been embodied in the article reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 248. Emphasis is repeatedly laid on the necessity for differentiating between the two main causes of sterility and also between them and effects conditioned by the genotypic constitution of the organism.

The inbreeding method (which has been worked out for beets but is applicable in any analytical study of fertility and sterility) when used in breeding cross-fertilized plants requires highly self-fertile races. The technique consists in altering the genetic constitution of cross-pollinated races by gradually restoring homozygosity by accumulating an increasing number of allelomorphs in the homozygous condition.

Races selected from populations for self-fertility should be re-isolated to obtain material for breeding.

Sterility may be due to lethal factors, or a low degree of self-fertilization or both and in all three cases different breeding methods are called for.
With beets in which the seed cluster makes it difficult to estimate the actual set of seed, in order to estimate the tendency to self-fertilization the embryo must be examined. The technique of artificial selfing of buds is described and the method of estimating the amount of self-fertilization that has occurred is indicated as well as its use, in conjunction with data on the relative rates of pollen tube growth, to distinguish races on the basis of the prevalence of self-pollination. This technique can be adapted to other plants.
In view of the difficulty of large scale embryological examinations, a simpler method of identifying which flowers have remained unfertilized by observing their morphological features is described. The percentage of selfing must, however, be determined by examination, not of the flowers, but of the ovules, which exhibit certain characteristics including differences in size at certain stages of the growth of the flower, according to whether they have been fertilized or not. Incidentally the corresponding phenomena in rye are outlined. This morphological examination can, where necessary, be supplemented by a cytological diagnosis.
The capacity of races for normal seed development can be determined by the percentage set and the viability of the seed, both of which may indicate the presence or absence of lethal factors. As before, the method of estimation to be applied to cereals and to beet respectively are shewn to differ. The characteristic morphological signs of degeneration of the seed at various stages in beets are described but they will not reveal the action of lethals and for this direct counts of the set of seeds or seed clusters must be used.
The hypothetical expectations for the occurrence of fertilized ovules in various instances are stated. Where inbreeding is practised also germination tests of control seed are recommended.
Breeding for self-fertility consists in (1) increasing self-fertilization and (2) eliminating lethals. The statistical probabilities underlying breeding operations with these two aims respectively are exemplified and the genetical analysis of races segregating for both the percentage of selfing and for lethal factors is similarly illustrated.
In breeding self-fertile races of hermaphrodite plants (e.g. beet and rye) if the inbred lines ultimately obtained are to be used as high yielding homozygous varieties, and not for hybridization, then the initial material should be chosen for its high self-fertility and a rapid rate of pollen tube growth to ensure success in any eventual competition with foreign pollen. On the other hand inbred lines required for hybridization purposes should be selected for their relatively slow growth rate of the pollen tubes.
Self-fertile races that have been isolated should be tested for their tendency to crossing under conditions suitable for uncontrolled pollination.

897. Kusatz, H. 633.63.00.14(43.6)
Richtlinien für die Sortenwahl im österr. Zuckerrübenbau. (**Directions for choice of varieties in Austrian sugar beet cultivation**).
Landeskulter 1937 : **4** : 68–71.
Deals with the performance of different varieties and their adaptation to the soil, climate and rainfall of various regions of sugar beet cultivation in Austria. A. B.

STIMULANTS 633.7

898. Bolsunov, I. 633.71:575.127.2
(On the characteristics of the first hybrid generation of *N. rustica* and *Nicotiana glauca* Gr.).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 11 (19) : 51–57.
N. glauca gives a very high yield under the conditions of the Ukraine, Northern Caucasus and the Crimea; its leaves contain 5 to 8 per cent of citric acid, it is perennial, frost resistant and immune to certain diseases. Hybridization of this species with makhorka (*N. rustica*) has therefore considerable practical interest.
The author attempted to cross several varieties of makhorka with *N. glauca* but only with Azerbaijan 116 was any success obtained. Using this variety as female parent 3 F_1 hybrids were obtained.

In general habit and time of flowering the hybrids resembled *N. glauca* rather than *N. rustica*. The leaves were not glaucous as in *N. glauca*, but had palisade tissue on both sides as in that species. A further resemblance to *N. glauca* was found in their perennial habit of growth. The hybrid pollen was sterile and in the field the hybrids set no capsules.

899. Modilevski, J. 633.71:575.127.2:576.354.4
[Cytogenetical investigation of the genus *Nicotiana*. III. Cytology and embryology of the hybrid F_1 *Nicotiana rustica* L. (variety "Azerbaidzhan") x *Nicotiana glauca* Gr.].
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 11 (19) : 59–71.
Meiosis was studied in the pollen mother cells of Bolsunov's material (Cf. Abst. 898 above). From seven to twelve bivalents were formed at first metaphase, the remainder of the 36 chromosomes being present in the univalent condition. The univalents tended to precede at first anaphase. Micronuclei were not formed. The pollen grains do not appear to develop past the one-cell stage. Numerous abnormalities were noted in the ovules and are described in some detail.

900. Modilevski, I. and Dsubenko, L. 633.71:575.127.2:576.354.4
(Cytogenetical investigation of the genus *Nicotiana*. V. A cytological and embryological study of the hybrids F_1 *Nicotiana rustica* L. x *N. paniculata* L., *N. paniculata* x *N. glauca* Grah. and *N. rustica* L. x *N. glauca* Grah.).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 13–14 (21–22) : 109–25.
Crosses were made between *N. paniculata* and four varieties of makhorka (*N. rustica*) and also *N. rustica* var. *pumila*. All hybrids shewed $12_{II} + 12_I$ at the first meiotic division. The bisporial type of embryo-sac formation was observed in all hybrids as in both parents. In *N. rustica* var. *pumila* x *N. paniculata*, in contrast to the makhorka hybrids, abnormal embryo-sacs were noted. A medium sized embryo with somatic plates in which 72 chromosomes could be counted was observed in this cross, which evidently forms amphidiploids rather easily. The hybrid *N. rustica* x *N. glauca* has already been described (Cf. Abst. 899 above).
The hybrid *N. paniculata* x *N. glauca* flowered but was completely sterile. No bivalent formation whatever was observed at meiosis, though a tendency for the univalents to associate end to end as metaphase was approached was noted. Pollen grains do not develop past the uni-nucleate stage nor embryo-sacs past the 4-nucleate stage.
It appears that the 12 haploid chromosomes of *N. paniculata* and *N. glauca* pair with a different set of 12 of the 24 haploid chromosomes of *N. rustica*. It is suggested that hybrids of *N. glauca* with *N. undulata* and *N. solanifolia* should yield interesting results. Each of the latter two species has been suggested as a possible parent of the amphidiploid *N. rustica*, *N. paniculata* being the other parent.

901. Ternovsky, M. F. 633.71:575.127.2:576.356.5
(Sesquidiploids of *Nicotiana rustica* L. x *N. glauca* Gr.).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 11 (19) : 41–50.
From 1932 to 1935, 88 hybrids have been obtained from the cross *N. rustica* ($n = 24$) x *N. glauca* (n = 12) and six have been studied cytologically. Two had 36 somatic chromosomes and four had 48, the latter being therefore sesquidiploids, arising from the fusion of a reduced *rustica* egg cell with an unreduced *glauca* male gamete.
The sesquidiploids were self-sterile, but fertile when pollinated with *N. glauca* and to a less extent when pollinated with *N. rustica*.
From two to eight trivalents were formed at first metaphase of meiosis in the sesquidiploids.

902. Ternovskij, M. F., Khmura, M. I., and Žukov, N. I. 633.71:575.127.2:581.192.6:575.11
Inheritance of nicotine and anabasin in interspecific hybrids with *Nicotiana glauca* Gr.
C.R. (Doklady) Acad. Sci. U.R.S.S. **1937** : **17** : 43–45.

N. glauca is distinguished from other species of *Nicotiana* by the presence of the alkaloid anabasin.

Crosses were made between *N. glauca* and *N. Tabacum* and *N. rustica* to trace the inheritance of this compound. In the F_1 there was a marked predominance of anabasin over nicotine, the amounts even exceeding that of *N. glauca* and it is suggested that the genes controlling the production of nicotine are able to interact with those controlling the closely related alkaloid anabasin and to increase the production of the latter.

In the succeeding generations the amount of anabasin decreased, which was to be expected as these hybrids are unstable and there is a tendency towards the elimination of the *N. glauca* chromosomes. There was no nicotine in any of the hybrids investigated of *N. rustica* x *N. glauca*.

903. Grancearoff, C. and Athanasoff, D. 633.71:575.42
Prinosa cămă selecţiata na aromatnitie tiutiuni. **(A contribution to the selection of aromatic tobacco).**
Tiutinov Pregled. **1937** : **6** : 91–100.

The author's experiments shew that the number of glandular veins in the leaves of *Nicotiana Tabacum* are a valuable guide for selection of aromatic quality. The more glandular veins the more aromatic the plant.

904. 633.71:575.42(49.8)
Arghirescu, V. 633.71 Yaka
Selecţionarea si aclimatizarea la noi a varietăţii de tutun Yaka din Macedonia. **(Selection and acclimatization in Rumania of the tobacco variety Yaka from Macedonia).**
Bul. Cultiv. Ferment. Tutun. **1937** : **26** : 383–93.

An account of the history of the cultivation in Rumania of the Yaka variety of tobacco, originally from Macedonia. The parentage of this variety is somewhat obscure—Comes derives it from the cross *Havanensis* x *Macrophylla* but Anastasia finds traces of *Brasiliensis* and suggests the cross *Brasiliensis* x *Havanensis* x *Purpurea*. Selection in recent years has produced a number of strains of which the best, Yaka 7, is described.

905. Greenleaf, W. H. 633.71:576.356.5:578.08
Induction of polyploidy in *Nicotiana*.
Science **1937** : **86** : 565–66.

The decapitation-callus method of producing tetraploids is not normally successful with *Nicotiana*, owing to failure of callus-formation. By application of a 1 per cent hetero-auxin paste made up with anhydrous lanolin, however, callus formation followed by development of adventitious shoots has been induced and about 500 tetraploids have now been obtained. The figures given indicate a percentage of tetraploid shoots of the order of 15 per cent. Success has been obtained with different hybrids and species and amphidiploids have been produced.

The tetraploids are recognized by stomatal size; those which have flowered have confirmed their classification as tetraploids. Other aberrant types were produced in smaller numbers.

906. Hachaturov, S. P. 633.71:576.356.5:581.03
(Induction of adventitious shoots in tobacco).
Bull. Appl. Bot. Leningrad **1937** : Ser. II (7) : 107–11.

Hybrids of *Nicotiana Tabacum* Dubec x American and American x Sumatra, together with their parental plants were decapitated in 1933, 206 plants in all being treated. The cut surface

was covered with moss which was moistened every day and regeneration occurred both on the callus and on parts of the surface where no callus had formed. No shoots were produced after decapitating plants in the cotyledon stage and the best results came from plants with 1–4 leaves. Regeneration was observed in 29 plants.
Regeneration was also induced at the base of the cut tips, which were planted and again decapitated.
In 1934 similar experiments were carried out on the varieties Havana, Havana x American and American, decapitating them above the first, second, third or fourth leaf and 18 plants gave shoots. Again regeneration was obtained too from the base of the tip after planting and decapitation.
The root tips of the regenerated plants are being examined for polyploidy.

907. Hachaturov, S. P. 633.71:576.356.52:576.354.46
(A *Nicotiana Tabacum* haploid with bivalents at meiosis).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 191–96.
One plant from the cross *N. Tabacum* x *N. quadrivalvis* (n = 24) differed morphologically from all the other hybrids and resembled the maternal plant. The somatic tissue contained 24 chromosomes and the plant is thus a haploid. It was smaller in all respects and its flowers were markedly heterostylous. Its pollen failed to germinate in an artificial medium and the plant was sterile in all attempts to cross it. All stages of meiosis shewed pronounced irregularities. However, varying numbers of bivalents, from 0 to 12, were present and this is taken as evidence of the autopolyploid nature of *N. Tabacum*, since if it were an amphidiploid no conjugation would be expected.

908. Povolochko, P. A. 633.71:576.356.52:581.036
(Experimental production of haploid plants in the genus *Nicotiana*).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 175–90.
Reference is made to haploid plants obtained by other investigators, including unpublished work of the Nikita Botanic Garden, where five haploids were discovered in a progeny of 40,000 seedlings from *Nicotiana* plants treated with X-rays.
The present author pollinated *N. Tabacum* (n = 24) with *N. Rusbyi* (n = 12) and *N. alata* (n = 9). An hour or two after pollination the plants were subjected to various temperature treatments, from +3 to +45° C., for varying periods.
Of the untreated seeds of the cross with *N. alata* none germinated. After treatment at +3° C., 12 seeds germinated and gave plants that all had pubescent cotyledons, shewing their hybrid origin, with the exception of one, which had glabrous cotyledons and proved to be a haploid. Many seedlings were obtained from the cross with *N. Rusbyi* and certain of these plants could be distinguished from the rest by their different morphological characters and by the fact that they flowered sooner than either the other hybrids or the maternal plant. Their flowers were smaller and entirely sterile, in selfing, back-crossing and crossing with other species. Chromosome counts shewed them to be haploids, with 24 somatic chromosomes. In habit and vegetative vigour these haploids were not inferior to the diploid parent.
Haploids were also produced in the treatments at 40° and 45° C., but none at the intermediate temperatures. In the *N. alata* cross at 3° C. certain fully fertile hybrids with 48 somatic chromosomes appeared too.
Flowers of *N. Tabacum* were pollinated also with *N. sylvestris* and the styles cut off in the region of the ovary after a certain time. When the styles were removed 8 hours after pollination a fruit developed, containing 250 seeds. Further observations shewed that alterations in the flower characteristic of the period following fertilization began 20–40 minutes after pollination though fertilization did not usually occur until 80 or more hours after pollination, a long period of maturation of the male nuclei being necessary after their arrival in the ovary. Abnormal temperatures interfere with this maturation process and with the growth of the pollen tube. The female gametes are not similarly affected and the result is therefore the development of the ovule without fertilization and the consequent production of haploid individuals.

909. Povolochko, P. A. 633.71:581.03
(Regeneration experiments in *Nicotiana Tabacum*).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 113–26.
By using the ordinary method of decapitation no regeneration was obtained in *N. Tabacum* and a modification was tried consisting in the insertion of a certain quantity of wound hormones, consisting of an infusion of ground young shoots of tobacco, potato and tomato, at the cut surface; fifty plants were treated in this way, twenty-six were treated similarly but with orchid pollinia and forty served as controls. The wound hormones caused the plants to blacken and die, and the same effect was produced by the pollinia of certain orchids. Those of other orchids however induced a vigorous development in the tissues adjacent to the pollen sacs and below, a callus being ultimately formed, the general growth of the plant being at the same time retarded, and the development of axillary buds inhibited. From the callus rootlets began to appear and were soon followed by adventitious shoots, these being formed both from procambial and parenchymatous layers. The best results were obtained from the orchids *Stanhopea* and *Lycaste*. As many as ten or more shoots often developed from one cut surface. It is hoped in this way to be able to induce polyploidy.

910. 633.71:581.33
Modilevski, J. 633.71:575.127.2
(A cytogenetical investigation of the genus *Nicotiana*. IV. On the embryology and cytology of the species of *sectio petunioides* and the classification of the genus *Nicotiana*).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 13–14 (21–22) : 63–79.
In the five *Nicotiana* species *longiflora*, *sylvestris*, *suaveolens*, *nudicaulis* and *Bigelovii* the eight nucleate embryo-sac develops from the lowermost of four megaspores. Surveying the available data on the embryology of the genus, the author concludes that it is too uniform to afford a basis for classification.
A table is given summarizing the results of interspecific hybridization in *Nicotiana*. The author considers that these data are not extensive enough to be of much help in relation to the problem of classification.

911. Boyarski, J. 633.71:581.45:575.11
(Inheritance of the leaf type of the Mutant variety in *Nicotiana rustica*).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 13–14 (21–22) : 173–78.
The variety Mutant has crumpled leaves which are turned down on either side of the midrib. The F_1 of the hybrid Vergun x Mutant has crumpled leaves, the smooth leaf of Vergun being recessive. The segregation in F_2 and in the back-cross, with Vergun indicates that a single factor pair (*I-i*) is concerned.

912. Frimmel, F. 633.71:581.45:575.11
Beitrag zur Kenntnis der Vererbung der Blattform mit spezieller Berücksichtigung von Tabak mit einer Ergänzung von Professor Dr K. Karas.
(A contribution to the knowledge of the inheritance of leaf-shape with special reference to tobacco with a supplement by Professor Dr K. Karas).
Rec. Inst. Rech. Agron. Rep. Tchéchosl. 1937 : **160** : Pp. 36.

Frimmel, F.
Über das Wachstum der Blätter und die Vererbung der Blattform. **(On leaf-growth and the inheritance of leaf-shape).**
Wien. landw. Ztg. 1937 : **87** : No. 25 : 198–99.
The first part of the first paper is devoted to a detailed study of the interaction of the growth factors responsible for the shape of leaves. The mathematical aspect is elaborated in a supplement by Professor Dr K. Karas.
In part II four types are distinguished. 1. Leaves differing in the factor *B* for breadth. 2. Leaves differing in the factor *N* controlling the growth of the basal region. 3. With

the same factors for growth but with an inhibiting factor *H* limiting growth in length. 4. Differing in the factor *L* for greater absolute length and relatively less breadth.
Crosses were made between varieties of *N. Tabacum*. In the first case the crosses were between types differing in the factor *B* and the results indicate the dominance of this factor.
Crosses between the variety Gartenblatt and Ghimpati, Persician and Samsun which were alike except that Gartenblatt shewed a marked reduction of the effect of the inhibiting factor for growth, shewed that this character is dominant. It proved impossible to find a type differing only in respect of the factor *N* but when crosses were made in which there were other differences beside *N* the form with the larger basal region was prevalent.
These results are discussed in connexion with the work of other investigators.
The second paper deals more shortly with the subject treated in the first.

913. Clayton, E. E., Smith, H. H. and Foster, H. H. 633.71–2.8–1.521.6:575.11
Mosaic resistance in *Nicotiana tabacum*.
Phytopathology 1938 : **28** : p. 5. (Abst.)
Out of 897 lots of seed collected from Mexico, Central and South America, 36 proved resistant to common tobacco mosaic, all resistant lots coming from Colombia and including some varieties quite distinct from Ambalema.
The resistant collections could be divided into two groups, highly and moderately resistant. In the first group, which includes Ambalema, resistance is governed by two major recessive factors and may be affected to some degree by modifying factors.

914. Nolla, J. A. B. 633.71–2.8–1.521.6:575.113.4
Inheritance in *Nicotiana*. III. A study of the character for mosaic resistance in *Nicotiana tabacum* L.
J. Hered. 1938 : **29** : 43–48.
The resistant parents used were the variety Ambalema (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 609) and certain mosaic resistant lines from the cross Ambalema x Turkish. The susceptible parents were Turkish (Samsun), White Virginia No. 9, a native tobacco and No. 144–9–1, a *Phytophthora* resistant line from the cross Cuban x Turkish.
The F_1 reciprocal hybrids were as susceptible as the susceptible parent. In F_2 segregation into 15 susceptible : 1 resistant was observed, indicating duplicate factors. The back-cross of the F_1 to Ambalema gave segregation into 3 susceptible : 1 resistant and in the F_3 the segregations obtained in the different families and the frequency with which they occurred supported the hypothesis of duplicate factors. It is concluded that resistant plants have the genotype $r_{m1}r_{m1}r_{m2}r_{m2}$. The application of this result in breeding for mosaic resistance is discussed.

915. Holmes, F. O. 633.71–2.8–1.521.6:575.127.2
Strains of tobacco resistant to tobacco mosaic.
Phytopathology 1938 : **28** : p. 9. (Abst.)
A dominant factor governing a necrotic type of response to infection with tobacco-mosaic virus has been transferred from *Nicotiana glutinosa* to *N. Tabacum* through the intermediacy of *N. digluta* by successive back-crosses to *N. Tabacum* with selection of necrotic type individuals. Repeated self-pollinations gave rise to wholly necrotic-type strains of tobacco.
The necrotic response makes the transfer of virus difficult and it is believed that tobacco-mosaic virus will be unable to maintain itself in the field in tobacco plants bearing this gene.

916. Kostoff, D. 633.71–2.8–1.521.6:575.127.2
Cytogenetic aspects for producing *Nicotiana tabacum* forms localizing tobacco mosaic virus.
Phytopath. Z. 1937 : **10** : 578–93.
Possible methods of transferring the necrotic response to mosaic virus from other species to *N. Tabacum* are considered in the light of the available cytogenetical information.
The F_1 *rustica-Tabacum* hybrids can be back-crossed to *Tabacum*, but no seed could be obtained

when the hybrids of *Tabacum* with *Sanderae*, *alata* and *glutinosa* were back-crossed to *Tabacum*. In these sterile combinations it is necessary to produce an amphidiploid and back-cross it to *Tabacum*, though the use of the F_1 form is to be preferred. The amphidiploid *N. digluta* (*glutinosa-Tabacum*) is being used in the U.S.A. and at Krasnodar to transfer the necrotic response of *N. glutinosa* to *N. Tabacum* (Cf. Abst. 915).

917. 633.72(54)

WELLENSIEK, S. J. 633.72:576.16

Indrukken van de theecultuur in Britsch-Indië. (**Impressions of tea cultivation in British India**).
Bergcultures 1937 : **11** : 1486–92.

WELLENSIEK, S. J.

Reisindrukken over theeselectie en-cultuur, 1937. (Verslag van een studiereis naar Britsch-Indië, Ceylon en Japan). [**Travel-impressions on tea-selection and tea-culture, 1937. (Report on a visit to India, Ceylon and Japan)**].
Arch. Theecult. Ned.-Ind. 1937 : **11** : 201–59.

In this account of a short tour in Ceylon, Assam, Darjeeling, South India and Japan, the prevailing methods of cultivation and their applicability to conditions in Java are briefly considered. The incidence of the various tea types (Chinese, Assam and hybrids between the two) in the places visited is indicated. In some parts of the world Assam teas are preferred to hybrid types (and the latter to Chinese) for resistance to diseases and pests: and in Assam the writer found evidence to justify this preference from the standpoint of resistance to the depredations of the red spider. Greater uniformity is another characteristic of the Assam teas as compared with the hybrids.

Some individual types of tea seen in the various countries are described and the relationships between various known types and their geographical origin are discussed. The writer suggests that the centre of origin of Chinese tea (which is older than Assam tea) may possibly be the Tibetan Mountains while for the Assam type, which may, it is believed, have been derived from the Chinese type by loss mutation, a secondary centre of origin, in the Naga Hills, may be postulated. The whole question of the distribution and cultural value of wild tea plants might with advantage be investigated under some scheme of international co-operation.

Various observations are recorded on nursery selection and mother tree selection at the Tocklai and St. Coombs stations and in Japan, the work of Tunstall, Wight and Tubbs being mentioned in this connexion and also with reference to vegetative and sexual reproduction. The laying down of selected plucking gardens and seed gardens is described.

As regards quality, the possibility is envisaged of obtaining by selection and breeding from hybrid types forms combining aroma and flavour and a high proportion of tip. External factors affecting quality are discussed.

918. VROLIJK, M. 633.72:575.42

Iets over een toetstuin van thee-oculaties gemaakt van op het oog geselecteerde moederboomen. (**On an experimental garden of tea buddings made from mother trees selected by visual examination**).
Bergcultures 1937 : **11** : 1500–03.

From a tea garden comprising a number of heterogeneous types including some Chinese, mother trees for buddings were selected on sight on the basis of the following criteria:— low branching, width and height of the bush, amount of branching, colour and suppleness of the leaf, downiness of the pekoe and well formed bush. The total number of buddings made was 3246, of which 70·3 per cent were successful and were ultimately used to form a plantation of clones which received its first pruning in October 1935. In 1936 the production (per plant per plucking) of the clones with the most regular yields was highly promising and in many instances considerably surpassed the output of trees obtained by selection of the 20 per cent best and most vigorous plants from a 3-year old nursery and treated as regards pruning and manuring in a similar fashion to those selected on sight.

Still better yields may be expected when the trees selected on sight are fully grown.

919. Weliensiek, S. J. 633.72:575.42
Grondslagen der theeselectie. (**Principles of tea-selection**).
Landbouwk. Tijdschr., Wageningen 1937 : **49** : 337–48.

Wellensiek, S. J.
Methoden der theeselectie. (**Methods of tea-selection**).
Erfelijkheid in Praktijk, Leiden 1937 : **2** : 55–56.

After a brief general outline of the cultural measures employed in raising tea plants for plucking and for seed the question of tea selection for yield (as distinct from quality) is considered under the following heads, though with particular emphasis on vegetative selection: study of the initial material, nursery selection, selection of mother trees, vegetative and sexual reproduction, vegetative testing and clone selection, the laying down of plantations for plucking and for seed, testing by breeding.

In general all the commercial types of seed may be regarded as of equal value as initial material for selection unless breeding for a particular characteristic such as quality, vigour or resistance to disease and pests is contemplated, in which case certain types are preferable to others.

For a more detailed account than that given here of nursery selection, the selection of mother trees and the laying down of plantations for seed the author refers to his previous papers. (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 445, Vol. VII, Abst. 728 and Vol. VIII, Abst. 203.)

The success attained by the use of buddings in vegetative reproduction is pointed out and the importance of using vigorous stocks, which can be obtained by nursery selection, is emphasized.

Clone tests are an essential preliminary to experiments in selfing or crossing. Moreover hybridization is probably the best method of sexual reproduction since degeneration may be expected to accompany inbreeding. The technique of crossing is being studied and it would appear that pollination after the removal of petals and anthers shortly before the flower opens is satisfactory.

Vegetative testing consists in determining the relative value of selected mother trees by comparing the productivity of their various progeny clones both *inter se*, with standard clones and/or with clones of average yielding mother trees and/or seedlings, specially selected for this purpose. Fisher's methods have been adopted. In 1935 tests of 850 clones with 25,000 buddings were begun and are expected to yield some very productive types.

The relative merits of the application of nursery selection or clone selection to the laying down of plantations of selected plants for plucking is briefly considered. Clonal selection gives a much higher yield but is slower and therefore much more expensive.

Comparatively little has been done in regard to breeding tests, i.e. yield tests of known trees and of seedlings from particular seed gardens. Cohen Stuart's investigation (1926) is cited as indicating the potential value of such tests. (Cf. also "Plant Breeding Abstracts", Vol. VIII, Abst. 202.)

920. Haan, I. de 633.72:581.46:581.165
De bloeiwijze en de bloem van *Thea sinensis* var. *assamica*. (**The inflorescence and the flower of *T. sinensis* var. *assamica***).
Arch. Theecult. Ned.-Ind. 1937 : **11** : 280–91.

The inflorescence and flower are described and their value as diagnostic characteristics in distinguishing clones is considered. The average number of stamens, and the average sum of the petals and sepals may be regarded as clonal characteristics; while the length of the style and stigmas might possibly serve as accessory features in the identification of clones.

921. Teixeira, E. F. 633.73(81)
A introducção de novas especies e variedades de café. (**The introduction of new species and varieties of coffee**).
Rev. Dep. Nac. Café, Rio de J. 1937 : **5** : 721–24.

In *C. arabica* the varieties Nacional, Sumatra and Amarello de Boccucatu are identical but for slight differences in the fruit; but within each there occurs a considerable range of different forms. A collection of coffee forms has been made, comprising representatives of 31 different species, which are enumerated. A list of synonyms is also in preparation.

922. KRUG, C. A. 633.73:575.1

Genetica de *Coffea*. Plano de estudos em execução no Departamento de Genetica do Instituto Agronomico. (**Genetics of *Coffea*. Plan of studies in progress at the genetical department of the Institute of Agronomy**).

Bol. Techn. Inst. Agron. Campinas 1936 : No. 26 : Pp. 39.

The work on coffee genetics started with the establishment of a large collection of coffee varieties and their classification. A list of the varieties in the collection is given, together with the chromosome numbers of fourteen forms.

Detailed observations were made on the floral biology; the amount of cross-pollination was found to be extremely variable. An improvement was effected in the method of hybridization (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 612).

Controlled pollination has shewn a number of the plants selfed to be heterozygous; various cotyledon anomalies were observed in the progeny. Bronze colour of the young leaves was dominant (though incompletely) to green; both these were dominant to purple. The purple type also had pink flowers, which again were recessive to white. Most forms have red fruits, yellow being exceptional, and yellowish green seeds; occasional forms with yellow seeds were also found, even in *C. arabica* as well as *C. Liberica*. The variety Bourbon proved to be genetically stable, the variety Murta heterozygous, giving 25 per cent Bourbon, 50 per cent Murta and 25 per cent (with deficiencies) of a dwarf type (anão) on selfing. Crossing Bourbon x Murta gave 50 per cent Bourbon and 50 per cent Murta. It is thought that Murta originated in São Paulo as a mutant from Bourbon. Mutations of this gene in both directious have frequently been observed in somatic tissue.

Similarly, the variety Maragogipe originated in Bahia as a mutation round about the year 1876, being a *gigas* form of *C. arabica*, though owing largely to its long internodes its yield is less than that of the original variety Nacional.

The form *erecta*, in which the lateral branches are negatively geotropic and when used as scions give an erect individual just as the terminal branches do, is dominant to the normal dimorphic form and thought to differ from it in one factor.

The fasciated type, *polysperma*, bred true in selfings and gave intermediate hybrids in crosses with the normal; preliminary back-cross data suggest that a single factor pair is involved.

The variety *anomala*, characterized by irregularities in development of nearly all organs, vegetative and reproductive, combined with a high degree of sterility, bred true on selfing. Hybrids of the normal individuals of Bourbon or Nacional were normal in the early stages but developed a tendency towards irregular vegetative development in later years.

A variety Goiaba, possessed of a leafy and persistent calyx, bred true on selfing and gave intermediate hybrids with the normal type. Another type with petaloid calyx was found but the flowers all dropped and no fruit was obtained.

Studies are also being made on the inheritance of the character *pendula*, involving long pendulous lateral branches, the character *monosperma* and *semperflorescens* (perpetual flowering) and on the form of the seeds and leaves, leaf variegation, the *columnaris* habit and a number of other characters.

Interspecific crosses are being carried out with the object of establishing the genetical relationships between the species and completing the polyploid series.

Cases of complete self-sterility have been observed in Robusta coffee and also in *C. Excelsa*. Somatic mutations have been observed involving single genes, chromosome anomalies and plastid irregularities; in the second class mutations from the somatic number 44 to 88 and conversely have been observed.

Individual plant selection is being carried out on all the main cultivated varieties at a number of different points over the country; 1000 different plants of the varieties Bourbon, Maragogipe and Nacional were planted for test in 1931 and 1933 and have been subjected to detailed examination, including both vegetative development and yield of market produce. The best individuals are being studied more intensively. Promising individuals were also selected on a number of estates all over the country. The yield of berries and of coffee of different qualities is being recorded annually. The percentage of "mokka" beans (round beans from one-seeded fruits) varies in different individuals, being as low as 2·5 per cent in some and reaching

48·1 per cent in others. Similarly the number of "shell" beans (resulting from the development of more than one seed per locule) is as much as 21·9 per cent in some individuals and as this seems to be a hereditary defect such individuals are discarded.
The leaf indices of the leaves are measured in each plant and are to be compared with those of the progeny.
The greatest emphasis, however, is placed on the character of the progeny of the trees rather than on their own characteristics. They have therefore all been self-pollinated and 500 seeds of each mother tree were planted, the time and percentage of germination, percentage of abnormal seedlings and colour of young leaves being noted. Great variation was observed in all these respects, Bullata (hexa- and octaploid) seedlings being of not uncommon occurrence. The two hundred best seedlings are selected and their further development watched, so that finally the twenty best plants are retained, the final choice being based on habit—medium size is preferred—branching, number of internodes, hardiness, healthiness, etc. Their later behaviour, flowering, maturity, yield, etc., are also followed over a period of six years. The best plants are further self-pollinated and the most successful used as sources of seed.
Hybridization is being carried on too, using principally the varieties Bourbon, Nacional, Maragogipe, Laurina and Mokka as parents. About 80 different hybrids of economic interest have already been obtained, some of the most promising being hybrids between different individuals of the same variety.
Research has been started on the possibilities of producing strains resistant to the berry borer *Stephanoderes Hampei* Ferr.

923. 633.73:575.42(92.2)

SNOEP, W. 633.73–1.557(92.2)

Koffieproductiegegevens van Soember Asin. (**Data of coffee production from Soember Asin.**).

Arch. Koffiecult. Ned.-Ind. 1936 : **10** : 219–29.

This paper deals with the yields over a number of years of different kinds of coffee—Robusta seedlings of varied age, "Robusta-like" plants, buddings and selected seedlings—on Soember Asin Estate (of the East and Central Java Experiment Station). The effects of age, situation and general growth conditions on the comparisons made are discussed. The tests were laid down with large numbers of clones and families and so include many that are now worthless. Yields are given as means for all years up to 1931 and for the older plantings, and then for 1933, 1934 and 1935 for all groups.
In spite of unfavourable conditions the selected plantings of 1929 gave higher yields for their first period than the older Robusta seedlings.
When gardens from 24 to 28 years old were compared with those from 13–15 years there was no tendency for yield to fall with age, but the effect of climatic changes from year to year was pronounced.
The yields of "Robusta-like" plants were roughly equal to those of pure Robusta, and increased relatively in 1933–35. Details are given for a number of varieties.
The mean yields of budded clones as a whole were considerably greater than that of seedlings (mostly from the same mother trees) for the first years of production. L. E. M.

924. 633.73:581.192.6(69.1)

CHEVALIER, A. 633.73 *C. Bertrandi*

Un nouveau caféier sauvage de Madagascar à grains sans caféine. (**A new wild coffee from Madagascar with beans without caffeine**).

Rev. Bot. Appl. 1937 : **17** : 821–26.

From time to time since 1901 species of coffee have been found and described from Madagascar and the neighbouring islands, more or less allied, which differ from the *Eucoffea* of the continent of Africa in certain botanical characters and which all have beans without caffeine. One of these new species, *C. Bertrandi*, is here described.

925. 633.74:575.42
GRAAFF, G. VAN BLARCUM DE 633.74:575.12
Iets over Cacaobibit en onderhoud van jonge aanplantingen. (**Some data on cacao planting material and the maintenance of young plantations**).
Bergcultures 1937 : **11** : 1556–61.

Mention is made of the early work in cacao breeding with special reference to the relative merits of the Criollo and Forastero types and the Djatti-Roenggo hybrids, as well as the work of Wellensiek and de Haan on pollination.

A cross made by the author in which the Criollo type was used as the female parent for pollination by a Forastero type has yielded vigorous plants which have not yet, however, borne fruit; but it is hoped that their value may be determined next year. The mother trees had been selected from among about 800 trees on the basis of yearly records of the number of pods produced. Nevertheless, it is pointed out that the ultimate yield of dry beans should be included in the criteria on which selection should be based; and the importance of cotyledon colour and the percentage of flat beans in choosing plant material is also emphasized. Research along these lines is yielding results though no definite conclusions can yet be drawn.

Discussing the measures to be taken in renewing old plantations the writer has observed that varieties with the highest proportion of the Criollo strain invariably degenerate sooner than plantations of the Forastero type.

The paper was followed by a discussion.

926. WETTSTEIN, W. v. 633.75:575"793"
Die Züchtung eines frühreifen Speisemohns. (**The breeding of an early ripening culinary poppy**).
Züchter 1937 : **9** : 284–86.

In an attempt to breed a strain of poppy with higher oil content, increased yield and earlier ripening, crosses were made in 1930 between an alpine poppy with closed capsules and a white opium poppy from Turkey but no very satisfactory combinations were obtained. Selection in the alpine poppy was begun in 1929 and strains were selected which ripened 17 days earlier than the earliest variety, Mahndorfer Viktoria, used for comparison. The oil content is also satisfactory.

927. PROCHASKA, M. 633.75–1.547.1:575:581.47
Einfluss der Bereifung der Kapsel sowie deren Form auf das Auswachsen des Mohnes. (**The influence of glaucousness and shape of the capsule on sprouting in the capsule in poppies**).
Landeskultur 1937 : **4** : No. 2 : 35–39.

Glaucous capsules absorb less water than those that are not glaucous. In the case of short capsules the danger of sprouting is greater than in long ones; similarly shallow stigmatic plates increase the danger of sprouting in the capsule, whilst it is decreased by conical plates. These facts may have various applications in the breeding of poppies. A. B.

928. CLOS, E. C. and
BELLATI, J. I. 633.77:581.162
Biología floral de la yerba mate (*Ilex paraguariensis* Saint-Hilaire). [**Floral biology of yerba maté (*I. paraguariensis* Saint-Hilaire)**].
Rev. Argent. Agron. B. Aires 1937 : **4** : 273–77.

The floral structure is described and the suggestion made that since the leaves constitute the commercial product it would be profitable to cultivate only male plants.

AROMATIC PLANTS 633.8

929. Shchavinskaya, S. A. 633.812:576.356.5:581.03
[Restoration of fertility in the geranium (*Pelargonium radula roseum* W.) by doubling the chromosome complex].
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 101–06.

P. radula roseum is sterile and thought to be a hybrid. Its somatic chromosome number = 72 and meiosis is irregular. By decapitating very low at the base regeneration was induced on the callus formed and some of the shoots (about 20 per cent) differed markedly from the parent plant (Cf. Abst. 930 below). These proved to have the duplicated chromosome number 144, whilst the shoots of the normal type had 72. The flowers of the tetraploid shoots were larger and contained well developed stamens and anthers containing abundant pollen that proved fertile. Large numbers of well developed seeds were obtained from self and free pollination, though very little was produced by crossing with the parental form.
Having obtained a fertile form of this valuable perfume plant it will now be possible to start breeding work upon it and also to grow it in future from seeds instead of cuttings.
Eighty-six plants have been obtained from seed of the tetraploid and are uniform in type.

930. Tatarinov, M. V. 633.812:576.356.5:581.03
[Experiments on doubling the chromosome set in the geranium (*Pelargonium radula roseum* W.) by means of regeneration].
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 93–99.

Decapitation was performed on a number of plants of *Pelargonium radula roseum*, the majority of the plants being left untreated after decapitation; a second group was kept in shady, moist but well ventilated conditions, a third was subjected to pricking and pressure, a fourth treated with an infusion of the ground lateral shoots of geranium and a fifth infected with *Bacterium tumefaciens*. A callus developed in the first group though its formation was slow. The second group was quicker but no shoots were formed from either of these calluses; in one plant a bud developed but soon died. In the third the callus died, the fourth formed none and the fifth formed large tumours which in a month's time bore large regenerated shoots which, however, were all badly deformed and failed to root.
All lateral shoots were removed as soon as they were formed and later callus formation was observed in the vicinity of the roots. From these, shoots were obtained, which differed from the parent plant in vigour and in the fleshiness and large size of their leaves and it is thought that they may be polyploids.

OIL PLANTS 633.85

931. Allison, C. C. and
Christensen, J. J. 633.854.54–2.484–1.521.6:575.11
Studies on inheritance of resistance to wilt in flax.
Phytopathology 1938 : **28** : p. 1. (Abst.)

The inheritance of resistance to *Fusarium lini* has been studied in 56 crosses involving 18 varieties differing greatly in their susceptibility. F_1 progenies were usually intermediate in resistance though in some crosses susceptibility or resistance was dominant. Segregation in later generations suggested that several factors are involved. The resistant variety Bison gave high percentages of resistant segregates. Some F_4 and F_5 progenies from crosses between Bison and Newland combine the wilt-resistance of the former and the rust-resistance of the latter with certain desirable agronomic characters.

932. Kozyr', A. T. 633.854.78:575(47)
(The results of testing the Ždanov varieties of sunflower in agricultural practice).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 4 : 41–43.

The new sunflowers produced by Ždanov gave yield increases of from 1·45 to 12 centner per ha. compared with the standard varieties over a wide range of different regions in the

U.S.S.R.; taking the yield of the standards as 100 the new varieties gave yields of 150 and up to 200 per cent. This great difference is largely brought about by their immunity to *Orobanche* attack.

933. Nilsson, H. 633.854.797:575.127.2
Ein oktonärer, fertiler *Salix*-Bastard und seine Deszendenz. (**An octonary, fertile *Salix* hybrid and its progeny**).
Hereditas, Lund 1936–37 : **32** : 361–75.
By artificial cross-pollination the following *Salix* hybrid has been produced: [(*purpurea* x *daphnoides*) x (*repens* x *aurita*)] x [(*phylicifolia* x *nigricans*) x (*viminalis* x *caprea*)]. Having combined the genes of so many species in one form, the author calls it *Salix polygena*. The first quaternary hybrid, (*purpurea* x *daphnoides*) x (*repens* x *aurita*) is diploid (n = 19) like all its parents. The second is produced from a hexaploid hybrid (*phylicifolia* x *nigricans*) crossed with a diploid (*viminalis* x *caprea*) and is tetraploid. The octonary hybrid, which is very fertile, appears to be tetraploid.
The progeny of the octonary hybrid are much reduced in vigour as compared with their parent and are suprisingly uniform.

934. Beirnaert, A. 633.855.34:575.42(67.5)
Que pouvons-nous attendre des palmeraies améliorées au Congo Belge? (**What may be expected from the selected palm plantations of the Belgian Congo?**).
Bull. Agric. Congo Belge 1937 : **28** : 471–90.
The Yangambi Station possesses about 20 hectares of selected palms which are now yielding. They have been grown from seeds which are either the result of selfing or of crosses between selected mother trees made in 1931 and 1932.
An examination of these young trees shews a large variety of types, the result of crossing. With regard to the characters of the shell three main types are distinguished—the pisifera type with no shell comprises 20–25 per cent and is economically valueless as most of them are sterile—the tenera type, 60 per cent and the rest the dura type.
The pisifera type always occurs in the same proportions among tenera progeny. Selection has resulted in reducing the proportions of some lines to 10 per cent and it is hoped to be able to eliminate the character completely. Crosses between tenera and dura are a possible solution but this involves a reduction in the oil content. An analysis of the yield of the selected trees shews their superiority over the unselected. Further increase in yield is possible by other methods of selection. The technique of two of these, the method of selective thinning and the replacement method, is described with their results and costs.

PIGMENT PLANTS 633.86

935. Oksijuk, P. 633.861.1:576.312.35:581.3
(**Comparative cytological and embryological investigation of the family *Resedaceae* I. *Reseda* and *Astrocarpus***).
J. Inst. Bot. Acad. Sci. Ukraine 1937 : No. 12 (20) : 3–81.
The following haploid chromosome numbers are recorded: *Reseda inodora* Rchb., 6; *R. media* Lag., 6; *R. phyteuma* L., 6; *R. odorata* L., 6; *R. lutea* L., 24; *R. crystallina* Webb., 12; *R. luteola* L., 12; *R. alba* L., 10; *R. glauca* L., 14; *Astrocarpus sesamoides* Duby., 10.
The embryology of the different forms is described in detail and discussed in relation to classification.

MEDICINAL PLANTS 633.88

936. 633.88:575:581.192
633.88:581.162.3
Iles-iles (*Amorphophallus* spec.). [**Iles-iles (*Amorphophallus* sp.)**].
Bergcultures 1937 : **11** : 1562–68.
The various species of *Amorphophallus* are described with observations on its uses and the anatomical structure of the tubers of some varieties, cultivation and breeding.

The most valuable species in breeding for mannan content belong to *A. oncophyllus*. *A. variabilis* too has yielded tubers with a high content but is very variable in this respect. Should this variability prove to be genetically conditioned clones with a high mannan content could probably be obtained by selection.
Specific differences have also been noted in tuber size. Differences in the rate of growth might be investigated with advantage. A collection of the various types containing mannan should be made, due attention being paid to the particular mode of reproduction that prevails in the wild state; for where reproduction is mainly vegetative, differences in mannan content will probably prove to be not genetic, whereas the presence of a greater variety of wild forms within a small area would suggest that hybridization is its underlying cause.
Preliminary studies of the floral biology of *A. variabilis* has revealed the predominance of cross-pollination in this species. Probably indeed all *Amorphophallus* plants are heterozygotes and both species should therefore offer a wide range of types for selection work.
From a study of the anatomical structure of the tuber a method has been devised whereby the amount of mannnan present can be roughly estimated with sufficient accuracy to justify further elaboration of the technique in view of its potential value in selecting plant material for breeding.

937. BARAT, H. 633.885.1:575.42(59.7)
La sélection du *Cinchona ledgeriana* en Indochine. (**The selection of *C. ledgeriana* in Indo China**).
Agron. Colon. **1937** : **26** : 138–50.

Although cinchona was introduced into Indo China in 1869 no work of improvement was started till 1917.
The organization for the cultivation of cinchona is described.
C. ledgeriana, the Malabar hybrid and *C. succirubra* are grown and selection for high yield of quinine and resistance to *Helopeltis* and to a disease caused by *Fusarium* are in progress.

RUBBER PLANTS 633.91

938. MAAS, J. G. J. A. 633.91:575.42(92.2)
Grepen uit de Heveaselectie van 's Lands Caoutchoucbedrijf. (**Notes on *Hevea* selection carried out by the Lands Caoutchoucbedrijf**).
Arch. Rubbercult. Ned.-Ind. **1937** : **21** : 23–36.

The author refers to previous results on selection work, which has now been increased and centralized. Numerous clones grown under the same conditions can now be compared directly. Planting plans and tables of the clones studied are given. Tapping results for a number of clones are tabulated and discussed. In general it is considered that the relative results are applicable elsewhere. Newer local clones promise to surpass those at present well known, and these can reasonably be expected to give more than 2,000 kg. per hectare (1,800 lbs. per acre) at a density of 200–250 trees per ha. (81–101 per acre). Secondary characters, wind damage and the colour of crêpe in particular, are discussed.
From the great bulk of work in establishing new clones from selected mother trees in the East Indies it is considered that not more than 10 or 20 new clones will surpass the old. Thus attention is directed to seedling selection. It is also doubtful if many seedling families will replace the known superior clones. Testing is going on, and now crosses between superior clones are under investigation.
Various aspects of the mutual influences of stock and scion are discussed. The scion may have the greater influence on growth.
For planting material it is considered that in general the known superior clones are to be preferred to the known seedling families, but small plots of these (e.g. from mono- or biclone blocks) should be included for trial before general use. Seed from polyclone blocks can be used for raising stocks.
L. E. M.

939. 633.912:575.42:581.165(92.2)
633.912–1.541.1
Hok, T. Y.
Eenige ervaringen met Hevea-selectie, o.a. met cloonenzaaisels. (**Some information on *Hevea* selection, including clone seedlings**).
Bergcultures **1937** : **11** : 580–87.

The lecturer describes his selection experiments in West Java, particularly a study of the influence of stocks. Ten clones were used as scions and their seedlings as stocks. Unbudded seedlings were included for comparison. No appreciable difference was found between the yields of latex on stocks of the three highest and on those of the three lowest yielding seedling families. Buddings on the three seedling families with the largest and on the three with the smallest circumference shewed scarcely any difference in yield or circumference.
In the few comparisons possible, clones on their own seedlings were very slightly better than on others.
From a comparison of their value as stocks none of the seedling families stood out as good or bad.
A short discussion follows on the future value of seedlings and buddings, and wide and close planting. L. E. M.

940. 633.912:575.42:581.165(92.2)
s'Jacob, J. C.
Laatste gegevens over Hevea-selectie in Besoeki. (**Recent information on *Hevea* selection in Besoeki**).
Bergcultures **1937** : **11** : 497–507.

This lecture gives a summary of information about recommended clones from Java, Malaya, Sumatra, with tabulated data on age, tapping system and yields, and special notes and recommendations on their suitability for monoclone or mixed planting in East Java. The best known and highest yielding families of legitimate and illegitimate seedlings are also dealt with, and reference is made to variability. L. E. M.

941. 633.913(47)
Legros, J.
Secondary rubber yielding plants of the Caucasus region and of Central Asia.
Int. Rev. Agric. **1937** : **28** : T 468–81.

A brief account of the Russian work on new rubber-yielding plants.

FRUIT TREES 634

942. 634:575
Lacarelle, A. and Miedzyrzecki, C.
L'application de la génétique en arboriculture fruitière. (**The application of genetics to fruit trees**).
Bull. Soc. Nat. Hort. Fr. **1937** : **4** : 304–19.

The three ways by which new varieties may be obtained—the selection from the results of uncontrolled pollination, the selection of bud variations and scientifically controlled pollinations—are briefly described and some of the results obtained are noted. Some of the new varieties of fruits recently produced by breeders in all parts of the world are described and finally the researches that are being carried out by the authors on the improvement of fruit trees in Morocco are recorded.

943. 634:575.127
Paškevič, V. V.
(**In memory of a great scientist and horticulturist**).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) **1937** : No. **6** : 3–6.

Lisitsyn, N. V.
(**The achievements of I.V. Michurin in the service of socialism**).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) **1937** : No. **6** : 6–9.

Perov, S. S.
(A revolutionary scientist).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 6 : 9–11.

Gorškov, I. C.
(I.V. Michurin—the founder of Soviet breeding science).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 6 : 11–16.

Stepanov, P. A.
(Michurin—the organizer of large scale experimentation).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 6 : 28–32.

A tribute to the work of Michurin and an outline of the gradual recognition of his work. The basis of this work was the Darwinian theory and the capacity of the hereditary make-up of the plant to be altered by suitable environmental influences, which was the guiding principle in his work on wide crossing in fruit trees. Michurin's varieties are now being grown in thousands all over the Soviet Union, especially in the north, in many parts where no horticulture has before been possible.

944. 634.1:575(47)
Černenko, S. F. 634.11:575.127.5:634.13
(Following the method of I.V. Michurin).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 6 : 16–21.

In breeding work with pome fruits along the lines indicated by Michurin emphasis is put in the first place on the choice of suitable parents; three lines of crossing work are pursued: (1) Central Russian varieties x southern, American or good Michurin varieties; (2) American or southern varieties x Michurin or local varieties; (3) crabs x southern Michurin and local forms. In dealing with heterozygous varieties it has been found that different forms differ in their success as parents and in the character of the progeny. A list of the best parents is given. Sixteen new apple varieties and one pear have been produced; their parentage is given together with brief descriptions. Most of them are winter or late ripeners and so help to extend the season; the fruits of one of the apples, Černenko's Pippin, keep until July. Some of them are high yielders, early bearers and free from disease.
Some of the new élites are promising and their origin and characteristics are given.
Apple x pear hybrids have been obtained by pollinating (1) the pear Tonkovetka with mixed pollen from six varieties; (2) Tonkovetka with Champagne Reinette pollen; (3) semi-wild pear with mixed pollen from various varieties. Sixty-five seeds were obtained and sixteen germinated, of which all but six died in the early stages and four somewhat later. The two remaining seedlings bore leaves of a type intermediate between apple and pear, great variation being observed in the leaves of a single individual. Grafts have been made of the seedlings on various stocks (Cf. Abst. 946).
Further apple x pear and pear x apple seedlings were obtained in 1935–36 and some of them appear to be definitely promising.

945. Johansson, E. 634.1:576.312.35:576.356.5
Kromosomtal hos plantor av äpple och päron ur korsningar mellan olika sorter. **(The chromosome numbers of apples and pears from crosses between different varieties).**
Sverig. Pomol. Fören. Årsskr. 1937 : 193–204.

The differences in thickness of the leaf and in size of the stomata of diploid and triploid species of pear and apple are tabulated and the chromosome numbers of the progeny of crosses between triploid and diploid apples and pears are given. One plant from the cross Belle de Boskoop x Filippa was tetraploid with 68 chromosomes. The data indicate that the pear Alexander Lucas is a triploid.

946. Černenko, S. F. 634.11:575.127.5:634.13
(Obtaining hybrids between pears and apples).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods, Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I.V. Michurin) 1936 : No. 6 : 8–15.

In 1935 seed was obtained on pollinating the Tonkovetka pear by (1) a mixture of pollen from six cultivated varieties of apples and (2) pollen from the "Champagne Reinette" as well as by pollinating the semi-wild pear with a varietal mixture of apple pollen. Examination of the 25 fruits obtained shewed that some of them had no seeds, being of parthenocarpic origin. The small number of seeds in the remaining fruits were more or less normally developed; but in one instance the seeds of a Tonkovetka pear were larger than the rest or than the seeds of the free pollinated controls.
Out of 65 seeds obtained 16 germinated i.e. 24·5 per cent as compared with an average germination of about 50 per cent for apples and pears.
The cotyledons of the seedlings resembled those found in hybrids of different varieties of pears, but the true leaves were either intermediate between the apple and pear type or else predominantly of the apple type or even exhibited complete dominance of the latter type.
The growth of the seedlings was backward and the majority did not get past the second, third or fourth leaf stage owing to defects in their root system and ultimately died. It is thought possible that one seedling similarly affected which was crown grafted on to an apple tree may survive, as part of the graft has taken. At the beginning of August only 6 seedlings were still alive and of these only 2 from the Tonkovetka variety pollinated by the apple pollen mixture were more or less normally developed.
The leaf characteristics of the apple appeared to be dominant in the seedlings. Observations are recorded on the shape and size of the leaves.
The six seedlings are individually described with notes on their root systems and their subsequent fate.

947. Fleckinger, J. 634.11:576.356.5:581.46:575.061.5:575–181
Grandeur de fleurs et pilosité du calice en rapport avec la polyploidie chez le pommier. (**Size of flowers and hairiness of the calyx in relation to polyploidy in the apple**).
C.R. Acad. Sci. Paris 1938 : **206** : 205–07.

It was found that the varieties with small flowers, generally deeply coloured, were diploid. The varieties with larger flowers, less coloured or paler, and with a very pubescent calyx, voluminous ovary and large anthers were triploid. Though there might be variation within the groups the diploid flowers were never so large as those of the triploid and, taken in conjunction with the other characters, they could readily be distinguished.
The nuclei of the triploids, as measured in the pollen mother cells, were larger than those of the diploids.

948. Šmelev, I. Kh. 634.11–2.111–1.521.6:578.081
(The frost resistance of Michurin's varieties of apples, according to the laboratory method of determination).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods, Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I.V. Michurin) 1936 : No. 6 : 39–55.

Young one and two-year-old grafted apple trees of varieties bred by Michurin and other standard varieties were grown and hardened in the open and then tested for frost resistance in freezing chambers in the laboratory. The results shewed that the laboratory methods can be used to estimate frost resistance and give data approximating closely to those obtained from nursery observations.
Certain varieties proved frost-resistant only under certain conditions, others, e.g. Reinette Bergamotte and Borsdorf crab, were highly resistant under varying conditions. For this reason the classification given of the varieties on the basis of frost resistance is only provisional.
Many of Michurin's productions were more resistant than other standard types.
Frost resistance of apples at 1 and 2 years of age is relatively low.

949. Schoene, W. J. and
Underhill, G. W. 634.11–2.7–1.521.6:581.49
Resistance of certain varieties of apple trees to injury by the leafhopper (*Empoasca Fabae*).
Tech. Bull. Va Agric. Exp. Sta. 1937 : No. 59 : Pp. 16.
Some 58 varieties are classified according to their susceptibility to leafhopper. It was found that resistance was positively correlated with the degree of pubescence of the foliage.

950. 634.13:581.47:575.252–18
Shamel, A. D. 634.13:581.47:576.356.5–18
A large-fruited bud mutation of the Winter Nelis pear.
J. Hered. 1937 : **28** : 350–52.
A pear tree of the Winter Nelis variety at Puyallup, Washington was found to produce fruits much larger than those characteristic of the variety. This character, which is probably due to a bud mutation, is maintained after vegetative propagation. The fruits are about twice the normal weight.
The mutant strain is diploid (2n = 34) like its parent. A somewhat analogous large-fruited bud mutation of the Bartlett pear occurring at Shafter, California was found to be approximately tetraploid (2n = 68).

951. 634.2:575(47)
Tikhonov, N. N. 634.2–2.42–1.521.6
(The improvement of stone fruits in the Far East Area).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods, Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I.V. Michurin) 1936 : No. 6 : 16–32.
A brief outline of the development of fruit culture in the Far East Area is given with an account of the stone fruits of the region with special reference to the local plum which is very widespread and which has been given the status of an independent species, *Prunus ussuriensis* Kov. et Kos., though originally introduced from China and the Korea. Other more recent importations from Manchuria are also mentioned.
Though sufficiently frost-resistant in the southern districts the varieties of plums found in the Far East Area frequently have poor keeping qualities and too short a season and also are susceptible to diseases.
Four species of wild and cultivated apricot are found in the region, but their cultivation is limited owing to the difficulty of combining high fruit quality and adequate hardiness. Pioneer and No. 1 are, however, two varieties that have been chosen as suitable for manufacturing purposes and for further improvement.
Five species of cherry in the wild state and three cultivated forms are found in the area but so far they have not been extensively grown. *Prinsepia chinensis* which closely resembles the cherries also occurs.
The results of expeditions made during 1928–34 to study local fruit culture and to collect varieties are recorded with data on the time of ripening and economic qualities of certain forms.
Crosses attempted between different species of cherries in the hope of obtaining varieties that come into bearing early are mentioned as well as a natural hybrid of *Cerasus japonica* and *C. humilis* from which nine selections with fruits of good quality have been made. Forms from Eastern Asia and America are regarded as the most useful cherries for selection and hybridization experiments; and special attention is being given to *C. tomentosa*, one of the most useful species; though deficient in cold resistance, it is undergoing selection to improve its hardiness and the quality of its fruit.
In hybridization work with plums, local forms have been crossed with *C. Besseyi* to obtain early bearing types with regular yields. Some of the hybrids were very early in coming into bearing, and frost-resistant forms were also obtained. Two cross-bred hybrids, Novinka and No. 20–33, have been chosen for further tests under severe climatic conditions.
Passing reference is made to other species hybrids and combinations of various kinds.

The need for disease resistant varieties can, it is believed, be met by interspecific hybridization. No local plums immune to *Rhodoseptoria* exist, but some (including certain American hybrids) exhibit high resistance and some of the hybrids between the variety Krasnaja No. 389 of the Ussuri district and the Burbank hybrid form "Shiro" have proved entirely immune; another derivative from the same cross is frost-resistant, with fruit of a good type.
Crosses made in 1928 between the local plum and the apricot yielded 196 fruits from 664 flowers pollinated. All the 53 plants ultimately raised died at various stages with the exception of one dwarfed type which had attained a height of 50 cm. when six years old. Buddings from it were grafted on to Ussuri plum seedlings, and at the age of one year the grafted plants are as tall as the mother plant.
A figure is included demonstrating the immunity of the hybrid between *C. pumila* and *C. tomentosa* to *Rhodoseptoria*, the resistant parent being *C. tomentosa* (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 273).

952. Shcherbina, M. L. 634.21–2.111–1.521.6(47.7)
(Sets of apricot trees of the Acclimatization Gardens of the Academy of Sciences of the Ukrainian S.S.R.).
Akademija Nauk U.S.R.R. Institut Botaniki, Kiev (Acad. Sci. Ukr. S.S.R. Inst. Bot. Kiev) 1936 : Pp. 120.
An account of the work that is being done to extend apricot cultivation in the forest steppe region (latitude 50–52° N.) of the Ukraine. The collection of local and introduced forms should be continued and the value of such existing material should be ascertained with a view to breeding new varieties adapted to various districts of the above mentioned tract.
The collection of apricot trees in the Gardens at Kiev is described and among the various populations is one group of 44 trees with small fruits and apparently rather frost-resistant wood. These trees, which are derived from local types growing in the environment of Kiev, may be provisionally described as giving a satisfactory yield. Insect injury was slight and ripening was early. Some individual trees with heavier fruits have been selected for further study and for their possible use in hybridization or the establishment of new clones.
Corresponding data are recorded for the "large fruited" trees (F_1) from the Crimea which are not however sufficiently frost-resistant, the wood and flower buds being subject to injury during cold periods. Some superior trees in this group which are frost-resistant, have relatively large fruits of good quality and colour, are to be studied further and used in crosses or as material for new clones.
Other less promising populations from various districts are described.

953. Kinman, C. F. 634.22:575.247.061.6
An orange-colored bud sport of the Agen plum.
J. Hered. 1937 : **28** : 419–20.
The mutant has orange-coloured fruits which are somewhat larger than the normal, reddish-purple fruits of the Agen variety, and carry smaller stones. It was observed near Sutter City, California.

CITRUS FRUITS 634.3

954. Akhund-Zade, I. 634.3:575.12
(A new variety of orange).
Soviet Subtropics 1937 : No. 8 (36) : p. 117.
The writer contends that the fruit referred to in "Plant Breeding Abstracts", Vol. VIII, Abst. 238, is not a new variety but an ordinary blood orange.

955. Bernard. 634.323:001.4
Pamplemousse et grape-fruit. **(Pomelo and grapefruit).**
C.R. Acad. Agric. Fr. 1937 : **23** : 894–98.

Chevalier, A.
Pamplemousse et grape-fruit. **(Pomelo and grapefruit).**
C.R. Acad. Agric. Fr. 1937 : **23** : 898–900.

In France grapefruit is known to the trade either as grapefruit or pamplemousse. Scientifically the terms are not synonymous. The name pamplemousse, in English pomelo, is derived from the Malay Pomplemous (also Pomum-melo, Pommemelon or Pompoleon). The fruits of most varieties are not eaten by Europeans.
M. Chevalier points out that the origin of both forms is obscure and neither is known in the wild state. The Pomelo, *Citrus maxima* Merrill or *C. decumana* L. was introduced into the West Indies by Shaddock or Chaddock, by which name it is sometimes known.
The grapefruit, *Citrus Paradisi* Macf. is believed to be a hybrid between the Pomelo and orange but is more likely a mutation.

956. Klimenko, V. N. 634.323:575.252
(Natsu-dai-dai and its forms in Adzharia).
Soviet Subtropics 1937 : No. 8 (36) : 81–83.

The systematic status of this form which, from the botanical standpoint, is intermediate between the pomelo and the orange and which is regarded by some authors as closely related to the grapefruit is discussed and its botanical and other characteristics are described. The early forms found in Adzharia differ somewhat in their fruit characters from the late forms. Of these earlier ripening forms Nos. 90 and 84 are recommended for commercial use as of good flavour and quality.
A bud mutant found by the writer is described and illustrated.

957. Schaffner, J. H. 634.38:577.84
Stability and instability of sexual conditions in *Morus alba*.
J. Hered. 1937 : **28** : 426–27.

Changes from the staminate towards the carpellate condition and from the carpellate towards the staminate in the white mulberry, without artificial stimuli, are recorded.

NUTS 634.5

958. 634.54:575.24
634.23:575.243
Ruys, J. 635.9:575.24
Excursie naar Dedemsvaart. **(Excursion to Dedemsvaart).**
Erfelijkheid in Praktijk, Leiden 1936 : **1** : 27–28.
Lezing van Dr. Ruys. **(Dr Ruys' lecture).**
Ibid 1937 : **2** : 42–43.

On this excursion an account was given of mutations of various garden plants (including lupins) and a mutation of *Corylus avellana* with twisted branches and of the Japanese cherry. In the latter case the mutation—weeping habit—was a sequel to pruning and was located at the site where lopping had been done.

959. Hull, F. H. 634.58:575.11:581.143.26
Inheritance of rest period of seeds and certain other characters in the peanut.
Tech. Bull. Fla Agric. Exp. Sta. 1937 : No. 314 : Pp. 46.

The American varieties used are classified into three groups, runner, Spanish and Valencia; 12 American strains were used in this work, together with one strain each of *Arachis Nambyquarae* and *A. Rasteiro.*

In the Spanish and Valencia groups of *A. hypogaea* the average time to emergence of mature seeds of different stains ranged from 9 to 50 days while in the runner group and in *A. Nambyquarae* and *A. Rasteiro* it ranged from 110 to 210 days. There are probably genetic differences between strains within the more and less dormant groups. Frequency distributions of time to emergence in pure strains and hybrid populations were skewed to the left; the more dormant the population the less the degree of skewness. It is suggested that rest period in peanut seeds is based on ultigenic inheritance, but that zero rest period coincides with a germination threshold at about the midpoint of the range of seed condition determining rest period. The left half of the usual picture of quantitative inheritance is thus compressed into the single class of zero rest period.

The mean time to emergence of F_1 seeds was intermediate between the parental values. In F_2 families marked trangression over the more dormant parent was observed in four crosses of Spanish and runner varieties.

In crosses between Spanish peanuts, with short seeds, and runner peanuts, with oblong seeds, segregation was noted in the F_2 plants into 1 short: 2 intermediate: 1 long. The character is determined maternally by a single pair of allelomorphs operating without dominance.

Russet seed coat colour of runner peanuts behaved as a simple dominant over tan colour of Spanish peanuts.

Yellow seedlings appeared in the progenies of certain crosses with frequencies suggesting the operation of duplicate genes. The genotype $L_1L_1l_2l_2$ is suggested for the Spanish group, $l_1l_1L_2L_2$ for the runner group and *A. Nambyquarae* and $L_1L_1L_2L_2$ for the Valencia group and *A. Rasteiro*. Deficiencies of recessives were found in several progenies and in some cases deficiencies of heterozygotes. An attempt was made to assess the elimination of recessive gametes and zygotes.

A type of plant habit characterized by sparse branching and a central stem in the fruit cluster is named Valencia plant type. It was also described in the article reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 73. Genetically it corresponds to the genotype $va_1va_1va_2va_2$, which constitution is borne by varieties of the Valencia group; Spanish varieties are $Va_1Va_1va_2va_2$ and runner varieties $va_1va_1Va_2Va_2$. It is suggested that these genotypes and also those for yellow seedlings support the classification adopted by the author.

In one F_2 family only, of a cross between Virginia Runner and Tennessee Red, male-sterile brachytic dwarf plants appeared. When the segregation of this character was tested in a later generation it was found to behave as a simple recessive.

The regression of 22 characters on rest period of seeds, seed shape, seed coat colour, yellow seedlings and Valencia plant type was tested but no associations were discovered. This is not unexpected in view of the high number of chromosomes (n = 20).

PALMACEOUS AND OTHER FRUITS 634.6

960. Beal, J. M. 634.62:576.312.35

Cytological studies in the genus *Phoenix*.

Bot. Gaz. 1937 : **99** : 400–07.

In the root tips of six varieties of *P. dactylifera* and in *P. canariensis*, *P. sylvestris*, *P. hanceana* var. *formosanum*, *P. humilis* and *P. reclinata* 36 chromosomes were found. At meiotic metaphase in the first three species, 18 bivalents were observed.

961. Šaškin, I. N. 634.65:575(47)

(*Actinidia* in the work of I.V. Michurin).

Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 6 : 25–27.

The course of Michurin's work on bringing *Actinidia* into cultivation as a fruit tree is outlined. The measures included mass production of seedlings, both from selfing and interspecific crossing, in order to subject them to the influence of the new environment and ultimately produce one adapted to it. In this way a number of varieties capable of being grown for fruit were produced. An extract, exceedingly palatable and with very high vitamin C content, is prepared from the fruits, which are now being used on a large scale for this purpose.

962. GUSTAFSSON, Å. 634.71:581.163:576.356.5
Species formation and polyploidy within the apomictic genera *Rubus* and *Taraxacum*.
Genetics 1938 : **23** : 149–50. (Abst.)

None of the American species belonging to *Rubus* subgenus *Eubatus* are apomictic. The thousands of European microspecies belong to two different groups, the *Rubi Eubati veri* and the *Rubi Corylifolii*, and only two sexual diploid species are known. All more or less apomictic *E. veri* are triploid, tetraploid and pentaploid (x 7). *Rubi Corylifolii* are hybrids between *E. veri* and the tetraploid, apomictic *R. caesius*; their chromosome numbers are 28, 35, 42 and 49. The occurrence of panmixis makes the taxonomy of the European *Rubi* arbitrary and superficial, in contrast to the obligatorily apomictic Taraxacums, in which the different groups are well defined taxonomically and ecologically.

963. 634.75:575(74.9)
CLARK, J. H. 634.75 Pathfinder
New strawberry named Pathfinder.
N.J. Hort. Soc. News 1938 : **19** : p. 971.

The new variety Pathfinder, which has been previously known as N.J.35 is a hybrid between Howard 17 and Aberdeen. A description of the plant and fruit characters is given. Pathfinder will probably be best adapted to the regions where Howard 17 (Premier) has grown well and its productiveness, long season and attractive colour should, it is hoped, make it a profitable commercial variety.

964. PETROV, D. F. and
TUKAN, D. A. 634.75:577.811
On the heterozygosity of the male sex in *Fragaria orientalis* Los.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : **16** : 459–60.

F. orientalis, a species with as a rule purely male or purely female flowers, was used as the male parent in a cross with *F. vesca*, homozygous for hermaphrodite flowers. Of the 16 plants that flowered among the progeny nine were female and seven male. It is therefore concluded that the male sex in *F. orientalis* is heterozygous.

965. COLLINS, J. L. and
KERNS, K. R. 634.774:575.247
Mutations in the pineapple, *Ananas comosus* (L.) Merr.
Genetics 1938 : **23** : p. 145. (Abst.)

The Cayenne variety has been propagated vegetatively for 100 years, during which time its heterozygosity has undoubtedly increased through the occurrence of mutations, which are preserved and increased by the vegetative method of propagation. Mutations have appeared influencing plant, inflorescence and fruit characters. Mendelian analysis has shewn that both simple gene mutations and those of a more complex nature have occurred, including dominant, recessive and lethal changes.

966. COLLINS, J. L. and
KERNS, K. R. 634.774:576.356.5
The origin and breeding characteristics of polyploid pineapples, *Ananas comosus* (L.) Merr.
Genetics 1938 : **23** : p. 145. (Abst.)

In the pineapple (n — 25) triploids and tetraploids occur infrequently among diploid hybrid populations. The entire progeny of a diploid x triploid cross consisted of tetraploid plants. Crosses of diploid x tetraploid give mostly tetraploids, with a few diploids and triploids. Meiosis is very irregular in triploids and very few functioning gametes are produced. Tetraploids have a regular meiosis and produce a higher percentage of functioning gametes.

VITICULTURE 634.8

967. Dix, I. W. and
Magness, J. R. 634.835(73)
American grape varieties.
Circ. U.S. Dep. Agric. 1937 : No. 437 : Pp. 34.

The characteristics, with special reference to those of economic importance, of 221 American grape varieties are given in tabular form. The species and varieties from which they are derived, the breeder and the state and date of origin are also given.

968. 634.835:575(43.6)
Von der Auslesezüchtung. (**On selective breeding**).
Weinland 1937 : 9 : No. 8 : 256–58.

Owing to the reduction of the area under vines the selection of the right variety and type of vine is of special importance, and differences in yield and quality must be considered. Since the performance of the vine stocks varies from year to year, only satisfactory ones should be propagated, hence positive and negative selection is necessary. The good and also the bad stocks are noted. Individual selection is far more successful (even if more tedious) than mass selection. The raising of clones, with progeny tests, reveals which are the best clones and these are entered in the register of élite vines. A. B.

969. Suškov. 634.835:581.162.31:581.162.52
(**On methods of regulating the yield of the vine**).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1937 : No. 4 : 169–73.

By a system of pruning applied to the normally self-sterile vine, Madeleine Angevine with functionally pistillate flowers, the author claims to have induced structural and functional changes in the pollen grains which consequently resembled the pollen of bi-sexual flowers. These changes were also accompanied by setting of fruit on normally self-sterile individuals. The possibility of obtaining a second crop in one year from the variety in question by suitable pruning was also demonstrated. Such a second crop resulting from self-fertilization can be obtained from other self-sterile varieties as well as the variety Madeleine Angevine.

970. Cosmo, J. and
Dell'olio, G. 634.835.094:575.12(45)
Die Direktträger in Venetien. (**The direct producers in Venetia**).
Weinland 1937 : 9 : No. 2 : 54–55 ; No. 4 : 124–26 ; No. 5 : 158–61 ; No. 6 : 194–95.

For many years in various localities in Venetia experiments have been made with direct producers, and the final judgment has been passed on a large number of hybrids. Data were obtained for each hybrid on vegetative development, fertility, diseases and quality. Almost all direct producers are resistant to phylloxera. Summarized tables of the data are shewn. The superior hybrids are classed in three groups in descending order of merit. Among the material investigated there was no hybrid worthy of being termed the ideal vine. No progress has been made during the past 20 years. The essential problem for breeders is still to combine quality and resistance to disease. A. B.

FORESTRY 634.9

971. 634.97:575(79.4)
Science seeks new trees for the forests of the future.
Institute of Forest Genetics, California 1933 : June : Pp. 23.

Austin, L.
The Institute of Forest Genetics.
Amer. Forests 1937 : September : Pp. 6.

The Eddy Tree Breeding Station was founded in 1925 at Placerville, California and in 1932 became the Institute of Forest Genetics. Its general aim is the development of superior

strains of forest trees, emphasis being placed on the desirability of rapid growth. The Institute has concentrated on pines and timber walnuts and a large collection of *Pinus* species is maintained and studied.
By progeny tests individual trees are tested for their value as seed-producers. These tests have indicated the existence of geographical strains within the different species; in the Sierra Nevada of California hereditary vigour is generally associated with provenance from a low altitude. Hybridization between different species is studied and has yielded promising results; the hybrid between the Knobcone pine, *P. attenuata* and the Monterey pine, *P. radiata*, for instance, combines the winter-hardiness of the former with the rapid growth of the latter. The longevity of forest trees has been found less disadvantageous than might have been expected, since many species flower at a very early age, in the first year in the case of *Pinus sinensis* and within the first six years in many cases. A certain degree of self-sterility and loss of vigour on selfing has been noted in several species of pine. The longevity of pine pollen is a useful characteristic from the breeding point of view, enabling crosses to be made with pollen transported over long distances.
Studies on vegetative propagation are carried on and successful buddings and graftings have been made with pines. These results may be applied for propagating useful hybrids.
X-ray treatment of seeds for the induction of mutations has been studied.
The dysgenic tendency of certain forestry practices is recognized and makes the work of the Institute all the more important.

972. MÜNCH, E. 634.97:576.16
Standortsrassen der Waldbäume. (**The ecotypes of forest trees**).
Ber. dtsch. bot. Gas. **1937** : **55** : 63–72.
The existence of ecotypes of forest trees was discussed by the lecturer and it is shewn that there are definite races, indistinguishable morphologically, which nevertheless react differently with regard to different soils, climates, diseases and other external conditions. These races have originated by a process of natural selection and their characteristics are inherited.

973. FUNK, G. 634.972:575.061.633
Über Auftreten und Variabilität von Buntblättrigkeit bei Laubbäumen des deutschen Waldes. (**On the occurrence and variability of variegated leaves in deciduous trees of the German forests**).
Ber. dtsch. bot. Ges. **1937** : **55** : 73–84.
Only the question of variegated seedlings is discussed in the lecture.
A type of ash seedling is described with normal green cotyledons but its first and later leaves are white or variegated. As these occur only in certain places it is assumed that the mother-tree is a heterozyote. Another type in which the cotyledons are variegated as well as the later leaves is probably due to plastid mutation. The different types of variegation in the seedlings from a variegated oak are described, and also from a variegated elm. Among the progeny of the latter there were no normal green seedlings and also some quite new types of variegation. Only accurate crossing experiments will determine the origin of these types. Probably external factors such as soil, nutrition or disease play a part in producing variegation.

VEGETABLES 635

974. ERWIN, A. T. and
HABER, E. S. 635(77.7)
Notes on some of the newer vegetables.
Bull. Ia Agric. Exp. Sta. **1937** : No. **363** : 131–49.
Remarks on the newer varieties, tested at Iowa Agricultural Experiment Station, of the following: snap beans, carrots, beets, tomatoes, sweet corn, cucumbers, watermelons, squashes, potatoes and rhubarb.

975. FUKUSHIMA, E. 635.15:576.356.5:581.162.5
On the chromosomal variants in Japanese radish.
Jap. J. Genet. 1937 : **13** : 222–23.

The causes of sterility in the Japanese radish may be of two types:—(I) Where the somatic chromosome number is 18, and the chromosomes shew no variation; and (II) where the sterility is due to chromosomal variation. In the first type the normal pollen mother cells are diploid, but some of them die owing to physiological causes. Also, pollen grains of the radish as a general rule tend to be sterile during the early stages of flowering.
Type (II) can be sub-divided into (*a*) variation in chromosome numbers (e.g. triploidy, tetraploidy and heteroploidy); and (*b*) chromosome translocation.
Among the progeny of Japanese radishes the following chromosome complements have been observed so far by the author:—2n = (36), 33 ±, 32 ±, (27), 26, 25, 22, 21, 20, 19, (18).
As regards the aberrations under II (*b*), all the cases found by the writer were "simple" translocations.

976. WETTSTEIN, W. VON 635.24:575.11
Über die Züchtung von *Helianthus tuberosus* (Topinambur). [**On the breeding of *H. tuberosus* (Jerusalem artichoke)**].
Züchter 1938 : **10** : 9–14.

The Jerusalem artichoke besides its culinary uses is a valuable fodder plant as both the green parts and the tubers can be utilized. Crosses between perennial species and *H. doronicoides* and *H. tuberosus* produced a quite useless F_1 and the F_2 has so far proved to be of no value. To obtain seeds of *H. tuberosus* tubers were sent to countries in the south. Those from Malaga gave the best results. Plants were grown in the greenhouse to induce early flowering but it was found that with early flowering went a reduced quantity of green stuff.
The method, already successfully used with willow and poplar, of growing the flowers in water, pollinating them artificially and keeping the flowers till seed is set, was used for inbreeding experiments. Unfortunately the effect of inbreeding was so strong that even in the second year of growth the plants were only a few cms. high.
The hybrids of *H. tuberosus* x *H. doronicoides* seem to be of value. The unsatisfactory characters of *H. doronicoides* do not appear in the F_1, which blooms in September and finishes the vegetation period in October.
Some hybrids of a white and a red skinned variety are being propagated.
Further aims in breeding are a still shorter vegetation period, a smooth tuber, a thicker skin, which would improve the keeping quality of the tuber, and increased protein and inulin content.

977. 635.25:575.14
KUMAZAWA, S. 635.25:575.125
Inbreeding in onions.
Jap. J. Genet. 1935 : **11** : p. 117.

The author presents a combined report on inbreeding in "Senshu" yellow onions (1920–33) and on F_1 hybrids from inbred pedigrees of the same variety (1933) at the Osaka Prefecture Agricultural Experimental Station.
All generations were obtained by selfing and selecting for superior weight was practised. Some pedigrees were "group selected" after individual selection had been carried out from 1–3 times; other pedigrees were only "group selected".
Of the 39 pedigrees examined 12 were constantly heavier than the average and 9 lighter. No pedigree with an inbreeding minimum could be isolated, but 5 pedigrees retained an index number of over 80 in the fifth generation, as compared with the parental form.
Ten typical pedigrees of G_5* and G_6 gave 16 F_1 plants of which 13 were heavier than the averages of their parents, some pedigrees showing marked heterosis, others none. Since no correlations for weight were found between the F_1 and their parents, or between either the increase in weight and the weight averages or differences between the parents, it is concluded that heterosis is independent of parental vigour.

* G = selfed generation.

978. Kwan, C. C. 635.34:575.11
Inheritance of some plant characters in cabbage *Brassica oleracea*, var. *capitata*.
J. Agric. Ass. China 1934 : No. 126–27 : 81–124.

A deep purple strain of cabbage crossed with a sun-red strain gave a purple F_1 of intermediate pigmentation and segregation in F_2 into 15 purple : 1 sun-red, the purple plants being of various degrees of pigmentation. Two independent, duplicate factors, R_1 and R_2 for purple are postulated, acting cumulatively and without dominance.

When the purple strain was crossed with a green strain the F_2 segregation was 9 purple : 3 sun red : 4 green. This and the F_3 results fit the hypothesis that two factor pairs are concerned: *G* is a basic factor for pigment which with *H* gives purple and with *h* gives sun-red. In the discussion the discrepancy between these and the above results is pointed out and it is suggested that the two sun-red types may be different.

Wrinkled foliage was found to be produced by two complementary factors, *W* and *S*. The many degrees of wrinkling observed may be due to the action of accessory factors.

Marked heterosis in respect of plant height and head weight was observed in the F_1. In the F_2 and F_3 in the case of plant height and in the F_2 in the case of head weight, the segregation agreed with that expected on the basis of multiple factor inheritance. Transgressive segregation in respect of plant height was observed.

Wrinkled-leaved plants had somewhat heavier heads than smooth-leaved ones and there was a small but significant positive correlation between plant height and head weight. No other indications of linkage were detected.

979. U, N., Midusima, U. and Saitô, K. 635.34:575.127.5:635.15
On diploid and triploid *Brassica-Raphanus* hybrids.
Cytologia, Tokyo 1937 : **8** : 319–26.

Two of the F_1 hybrids resulting from the crosses *Brassica oleracea* L. var. *acephala* DC. (n = 9) x *Raphanus sativus* L. (n = 9) and *R. sativus* L. x *B. campestris* L. (n = 10) are shewn to be triploid. That arising from the first cross has 2n = 27 instead of 18; that from the second has 2n = 28 instead of 19. It is shewn that this is due in both cases to a duplication of the maternal set.

The diploid hybrids usually shew no bivalents (occasionally 1 3) in meiotic metaphase, the triploids shew 9 bivalents. It is suggested that they have arisen not by non-reduction of the female gamete but by the action of the foreign male nucleus in stimulating the female nucleus to divide with subsequent fertilization after the chromosomes have undergone the first division. J. G. H.

980. Karpechenko, G. D. 635.34:575.127.5:635.15:576.356.5
(Reciprocal hybrids between *Raphanobrassica* and tetraploid cabbage).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 447–53.

Though *Raphanobrassica* is sterile in crosses with the parental cabbage, nine seeds were obtained on pollinating it with the tetraploid cabbage and seven in the reciprocal cross; all gave hybrid seedlings intermediate in type between *Raphanobrassica* and tetraploid cabbage. They produced neither heads nor flowers in the first year, flowering in the second year. In spite of the presence of three cabbage genoms to one radish, the white flower of the latter was still dominant. The pistil was of the cabbage type in the lower $\frac{2}{3}$ of its length, corresponding as in other hybrids of this kind to the proportion between the genoms, there being no difference between the reciprocal hybrids in this respect. The hybrids had 36 somatic chromosomes and were sterile, trivalents and univalents being frequently present at meiosis.

981. LUTKOV, A. N. 635.34:575.127.5:635.15:576.356.5:581.03

(On the artificial induction of polyploid gametes by treatment with low temperature and chloroform).

Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 127–50.

The literature on the subject of the production of polyploid gametes through the agency of temperature changes or narcotics is reviewed. The author then describes his own experiments on *Raphanobrassica* F_2 seedlings. The branches bearing young flower buds were cut off and placed in water in a chamber at a temperature of 0 to −2·5° C. for periods varying from a few hours to two days. Similar branches were treated with chloroform vapour for intervals of from 40 minutes to 1 hour 45 minutes.

The buds were fixed and examined. The untreated buds and those at 0 to −1·5° C. for 2–3 hours were normal in meiosis; those treated for 24 hours or more or with chloroform for one-and-a-half hours shewed distinct irregularities in meiosis, leading to pollen grains with increased chromosome number—e.g. dyads resulting from non-separation of the chromosomes to the poles, wall formation in one direction only, or omission of the second division; formation of restitution nucleus and monad formation; triad formation, etc. The various abnormalities are described. Diploid and tetraploid gametes were formed in this way, and also by the delay in wall formation resulting in the inclusion of all chromosomes after division in the one cell and consequent monad formation which was occasionally observed. The various anomalies are illustrated by a number of drawings and also diagrammatically. The number of monads formed in some buds was as many as 7·15 per cent.

The pollen grains formed from these abnormal flowers were larger than the normal, and had a thicker membrane and an increased number of pores. The number of diploid grains counted in one preparation amounted to 6·62 per cent and the number of tetraploid to 2·34 per cent and the number is thought to be in some cases considerably higher. The amount of abnormality varied in different anthers and evidently depends on the particular stage at which the treatment is applied, together with a number of other factors.

982. KARPECHENKO, G. D. 635.34:576.356.5:575.127

(Increasing the crossability of a species by doubling its chromosome number).

Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 37–51.

The amphidiploid *Raphanobrassica* was found to be almost sterile in crosses with the parental species, but fairly fertile with other species such as *Brassica carinata* and *B. napus*, which hardly cross at all with the original parents. The tetraploid cabbage however (Cf. Abst. 986) gave quite good results in crosses with *Raphanobrassica* and the results of crosses of this new cabbage with nine different *Brassica* species are presented. It crosses with *B. carinata, B. chinensis, B. nipposinica, B. campestris, B. juncea, B. napus* and *B. napella,* the best results being obtained by using it as pollen parent. It will not cross however with *Raphanus raphanistrum*. Thus by the production of this tetraploid the range of possible crosses to be made with *B. oleracea* has been enormously increased. It is pointed out that in some of the combinations the chromosome numbers are less similar than when using the diploid cabbage (e.g. in *B. chinensis* and *B. nipposinica* n = 10 and *B. oleracea* n = 9), so that the improvement in compatibility is not entirely to be ascribed to the adjustment of the chromosome numbers. Moreover different individuals of all these species give differing results in crossing with the tetraploid cabbage, certain individuals being still quite sterile with it. Tetraploid cabbages obtained from different parent plants also differ in their fertility with the other species. Since the material is all heterozygous it is concluded that hereditary differences in compatibility are the cause of this phenomenon and that the increased fertility of the tetraploid is in part the result of a different segregation and balance of the genes governing pollen germination; e.g. if the diploid produces pollen grains of the type S_1 and S_2, the tetraploid will produce three types, S_1S_1, S_2S_2 and S_1S_2. In the style it is probable that chromosome duplication would affect one gene slightly differently from the other.

There are probably other differences too. For instance in crosses of the diploid cabbage with *Raphanobrassica* elimination of the radish chromosomes sometimes occurs (Cf. Abst. 985), whereas this has never been observed in crosses with the tetraploid.

983. KARPECHENKO, G. D. 635.34:576.356.5:575.127.2
(Experimental production of tetradiploid hybrids *Brassica oleracea* L. x *Brassica carinata* Al. Braun).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 53–68.

By crossing the tetraploid cabbage (Cf. Abst. 986) with *B. carinata* several hundred hybrids with two cabbage (n = 9) and one mustard (n = 17) complements, i.e. 2n = 35 were obtained. By decapitation, individuals with twice this number were produced, having therefore four complete sets from the one parent and two from the other.

The original hybrids were large vigorous plants intermediate in type between the two parental species, flowering in autumn. The regenerated cuttings flowered in the greenhouse in March and April. Out of 455 cuttings examined cytologically three proved to have 70 chromosomes, i.e. about 1 per cent. One plant moreover had 66, being thought to have arisen from a plant with the normal number, which shews that by decapitation it is possible to produce changes in chromosome number other than duplication. Two further cuttings were found with 38–39 chromosomes and these are thought to have arisen from seedlings with this number. All the plants with increased chromosome number were produced from decapitation carried out in the latter part of the year, in September, and this it is suggested may be connected with the fall in temperature which occurred about that time. Special experiments are being instituted to study the effect of cold and other factors on the production of polyploid shoots.

The polyploid cuttings were distinguished from the normal by their larger buds and flowers and by their much higher fertility, though still their seeds were of low viability, only ten plants being obtained from 33 seeds sown. Seven of these were seedlings from 70 chromosome individuals and 1 had also 70 chromosomes, the others 62–65; the remaining three were from the 66 chromosome individual and one of them had 60, the other two about 50 chromosomes.

In the ordinary hybrids the number of bodies at metaphase 1 varied between 18 and 28; in all but the last case some were undoubtedly trivalents formed from the cabbage bivalents and the corresponding chromosomes of the mustard genom; varying numbers of bivalents and univalents remained. The pollen grain formation was very irregular and the hybrids were largely pollen sterile.

The 70 chromosome hybrids were much more regular in meiosis and although multivalents of various kinds, up to sexavalents, were formed at late prophase, they later separated, so that about 35 bivalents were present at meiosis. Owing to the occurrence of both autosyndesis and allosyndesis, combined with certain minor irregularities in both first and second divisions, it is probable that many of the pollen grains contained exactly 18 cabbage + 17 mustard chromosomes and this would therefore account for the low fertility.

984. KARPECHENKO, G. D. and
BOGDANOVA, E. N. 635.34:576.356.5:575.127.2
(A fertile tetraploid hybrid *Brassica oleracea* L. x *Brassica chinensis* L., experimentally produced).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 455–64.

The common cabbage will not cross with *B. chinensis* but when the latter species was pollinated by the tetraploid cabbage many seeds were obtained. The hybrids, which had 28 chromosomes, produced 9 bivalents from the two cabbage genoms, leaving the 10 *chinensis* chromosomes as univalents, and are sterile. Adventitious shoots were obtained from these hybrids by decapitation and one of them proved to have the duplicated chromosome number 56 and at meiosis produced 28 bivalents. Its buds and flowers were larger than those of the other hybrids and were completely fertile: 148 seeds were obtained from this one cutting, while the 199 remaining cuttings produced only one seed between them. Thirty seedlings have been obtained and the majority of them have 56 somatic chromosomes, though odd ones with 55, 57, 58 and 61–63 appeared.

The tetraploid hybrids resemble cabbage more than *B. chinensis*, flowering at the extreme end of the season; they shew a certain irregularity in leaf formation. At metaphase I they usually form 28 bivalents, with certain slight irregularities such as autosyndesis, appearance of unpaired chromosomes, which occasionally divide, etc. accounting for the aberrant chromosome numbers of some of the progeny.

985. 635.34:575.356.5:575.127.5:635.15
SHCHAVINSKAYA, S. A. 635.34:575.127:576.312.37
(Elimination of radish chromosomes and conditions necessary for their functioning in crosses of cabbage and its polyploid forms with radish and radish-cabbage hybrids).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 79–91.

Fifty flowers of the cauliflower were pollinated with *Raphanobrassica* and three seeds were obtained. These were sown in August and gave plants of the *Brassica* type which were intermediate between the cauliflower and cabbage, with elongated leaves of slightly darker colour, being somewhat more vigorous than the control plants of cabbage. They shewed a marked resemblance to hybrids of cauliflower pollinated by ordinary cabbage produced at the same time. They bore yellow flowers, as opposed to the dominant white of cabbage x radish hybrids. Moreover 9 bivalent chromosomes were observed at metaphase I and 9 + 9 at metaphase II, shewing that the 9 radish chromosomes of the male gamete had been eliminated, which accounts for the absence of radish characters.

Similar crosses were made of red cabbage with pollen from *Raphanobrassica*, in which 58 seeds were obtained. Again the hybrids were of the *Brassica* type, intermediate in leaf colour between red and white cabbage and resembled hybrids of red x white cabbage produced as controls. They differed from these latter hybrids in their more elongated habit and greater vigour. Their flowers were yellow. The chromosome number 2n = 18 was again disclosed on cytological examination shewing that the 9 radish chromosomes had been eliminated. The F_2 generation segregated into red, intermediate and white in the same way as the control hybrids. When the tetraploid cabbage was pollinated by *Raphanobrassica*, twenty-six seeds were produced from thirty-six flowers pollinated, ten of these being empty seeds which failed to germinate. The plants produced this time possessed clear radish characters in the form of pubescence and long dissected leaves. Few flower buds were formed and these dropped before opening, except in one plant which produced flowers with withered, deformed petals. The flowers were white and chromosome counts shewed the presence of 3 *Brassica* genoms and 1 radish genom (BBB : R), the plant having 36 chromosomes in all (4n). One diploid plant was produced in pollinations of cabbage with the hybrid BBR and yet displayed one clear radish character, namely white flower. It had 18 chromosomes and shewed no meiotic irregularities, from which it is concluded that the white flower gene was transferred by interchange between a cabbage and radish chromosome, or arose in some quite different way. On pollinating diploid cabbage with *Raphanus sativus radicula* large seed-pods were formed but they contained no seeds. It is thought that fertilization was effected but that the radish chromosomes were eliminated and the embryo then died.

The different behaviour of the radish chromosomes in the tetraploid cabbage cross is apparently due to the fact that in this latter they are not physiologically incompatible as they were in the diploid, owing evidently to some alteration in the cell properties resultant upon polyploidy. Accordingly further pollinations were made, this time of the octoploid cabbage with radish and *Raphanobrassica*; two seeds were obtained from the former and five from the latter cross. The hybrids from *Raphanobrassica* again contained radish chromosomes, having 54 chromosomes in all, BBBBRB. Furthermore one of the seeds from the radish cross produced a plant with clear radish characters; it had 45 chromosomes, thus BBBBR. Since no form BBR was obtained from the cross of tetraploid cabbage with the radish it is thought that the proportion BBB : R is the minimum for the successful functioning of the R genom in *Brassica* tissue, again illustrating the importance of chromosome balance in determining compatibility.

986. SHCHAVINSKAYA, S. A. 635.34:576.356.5:581.03
(Tetraploid cabbage obtained by means of regeneration).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 13–36.

Young plants of cabbage (*Brassica oleracea capitata*) in the 5–6 leaf stage were decapitated, three leaves being removed with the tip. Certain precautions necessary in carrying out the decapitation are mentioned, in particular, cool, shady and moist conditions. No callus was formed but adventitious buds appeared on the wound surface, along the course of the vascular system, after about 30 days or later in 27 per cent. of the plants treated. When the regenerated

shoots had reached a certain size they were removed and rooted, thus allowing others to develop on the treated plant. In this way 315 regenerated cuttings were obtained, some being very weak so that only 157 remained in the following spring. Of these 2 per cent proved to be tetraploid.

Cuttings were observed representing all forms of leaf known in the cabbage at different growth phases, as well as a number of anomalous forms. They flowered and bore seeds abundantly. The tetraploids were distinguished by their unusually thick, hard and dark coloured leaves and large buds and flowers, the latter too being somewhat deeper in colour; their pollen grains had four in place of the usual three pores and were over half as large again as those of the diploid (1·6 : 1).

The chromosome numbers were determined in 5–6 root tips per individual and also in the pollen mother cells, metaphase I and II. The tetraploid number was observed in 2 per cent of the plants. Five individuals had some root tips with the diploid and others with the tetraploid number, these plants all having the diploid number in pollen mother cells. Root chimaeras were observed in two individuals, a small sector of tetraploid tissue being present.

Meiosis was compared in diploid and tetraploid individuals obtained from the same parent plant. Bivalents in the form of rings or rods were observed in the diploids and the further behaviour was normal. In the tetraploids too the majority of combinations were bivalents, with a certain number (1–4) of quadrivalents of various configurations, and also a few higher combinations. The behaviour of the chromosomes in the later stages of meiosis was on the whole regular, apart from certain minor differences in time of movement to the poles etc. and 18 + 18 chromosomes were observed at metaphase II in the majority of cases, with occasional deviations such as 16 + 20 and 17 + 19. In rare cases however a daughter cell with the haploid number 9 was produced, leaving the other with 27, in consequence of which triploid and pentaploid individuals might be expected. Apart from an unusual scattering of the chromosomes at anaphase II the further course of the second division was regular and tetrad formation was normal. The proportion of abortive pollen grains amounted to 5·6 per cent in the tetraploids and 7·7 per cent in the diploids.

The tetraploids were just as self-fertile as the diploids but crosses between the two gave a very small number of inferior seeds. The selfed seeds of the tetraploid gave 100 per cent germination. The seedlings were somewhat larger than the diploids and in consequence of the greater cell size, leading to thick, stiff leaves, the plants were somewhat unusual in appearance. Both forms produced heads, the average weight of which for the diploids was 1,354 grm., for the tetraploid 1,976, i.e. a ratio of 1 : 1·4. The tetraploid heads were more solid and juicy, though with a greater tendency to split; they had a somewhat higher acid and saccharose content.

Sixty seedlings of the tetraploid were examined cytologically and 57 of them had 36 chromosomes in the root tips, two had 36–37 and seven had 35–36. These and the F_2 seedlings shewed segregation in a great number of characters, which was observed also in the progeny of the diploid; certain individuals in both progenies failed to form heads.

In discussing her results in comparison with those of other workers the author comes to the conclusion that binuclear cells are normally produced by the meristem periodically and in certain zones. Under certain circumstances these binuclear cells may regain their dividing capacity and so lead to the formation of tetraploid cells. Wounding is one of these circumstances and in the cabbage leads to the direct regeneration of shoots, in certain other plants such as tomato to callus formation and later regeneration. In the former case tetraploid shoots occur singly, in the latter case several may be formed on one wound callus. From this it is clear that the wound must be made in the zone where these binuclear cells are found, e.g. in the zone where new shoots are produced as opposed to the middle of the internode.

987. 635.34:576.356.5:581.03

SHCHAVINSKAYA, S. A. 635.34:576.356.5:575.127

(Octoploid cabbage experimentally obtained).

Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 69–77.

Experiments were designed to test the influence of various environmental factors on regeneration. Thus 200 plants of diploid cabbage and 100 tomato plants were decapitated and grown

in different conditions of moisture. It was found that a high humidity of the air favoured regeneration but excessive moisture in contact with the cut surface retarded it, very markedly in the cabbage and somewhat less so in the tomato experiments. The best results were obtained by covering the cut surface with a thin layer of moist moss that had been well squeezed to remove surplus water.

Similar decapitations were made on 75 tetraploid and 50 triploid cabbage plants, which gave about 16 per cent regeneration, as compared with 20 per cent in the diploids. One regenerated shoot, which produced a head in the following year and flowered in the succeeding year, was distinguished by unusually large flower buds and the flowers proved to be double and also much larger than those of the tetraploid, their colour being deeper and the number of stamens increased to 8–12; the pollen sacs were somewhat smaller and contained much less good pollen. This shoot proved to be octoploid. At metaphase I in these flowers univalents, bivalents, quadrivalents and octovalents and various indefinite chromosome conglomerations were seen. Cells with two spindles and other irregularities of division were frequent and tetrad formation was quite irregular, the number of cells produced varying from 5 to 12. The octaploid was almost entirely sterile; only three seeds were obtained from selfing, 7 full and 5 empty ones from open pollination and none in crosses with either the diploid or the tetraploid. On the other hand by pollinating with *Raphanus sativus* two seeds were obtained and five in pollinations with *Raphanobrassica*, again shewing that polyploidy alters the compatibility of a species, since neither of these genera will cross readily with the diploid cabbage.

988. 635.41:576.312.35:576.354.46
LORZ, A. 635.41:576.16
Cytological investigations on five Chenopodiaceous genera with special emphasis on chromosome morphology and somatic doubling in *Spinacia*.
Cytologia, Tokyo 1937 : **8** : 241–76.

A survey of the chromosome number and morphology in *Sueda linearis*, *Kochia scoparia*, *Salsola Kali* var. *tragus* and *Chenopodium ambrosioides*.

The study of nine species and varieties of *Spinacia* shews that *S. oleracea* and *S. tetandra* cannot be considered as distinct species.

Cell division figures in *Spinacia* root periblem when subjected to statistical analysis lead to the conclusion that somatic doubling is brought about by asynchronization of chromosomal and nuclear behaviour. It is unknown whether this is due to acceleration of chromosomal division or retardation of nuclear division but it is thought to be under the influence of environmental factors. J. G. H.

989. FALKOWSKI, L. 635.48(43.8)
Cechy handlowych odmian rabarbaru w ujęciu liczbowem. (**Commercial qualities of rhubarb varieties expressed numerically**).
Roczn. Nauk Rol. 1937 : **43** : 152–84; also Roczn. Nauk Ogrodniczych 1936 : **3** : 139–62.

Measurements of various morphological characters of the leaves and of the composition and acidity of the sap revealed certain correlations. Descriptions of a number of varieties are given, those with the most desirable characters being indicated.

990. CURRENCE, T. M. 635.64:575.11"793":576.356.5
The relation of the first chromosome pair to date of fruit ripening in the tomato (*Lycopersicum esculentum*).
Genetics 1938 : **23** : 1–11.

A plant homozygous for four dominant marker genes on the first chromosome pair fruits 19 days earlier than a plant homozygous for all the recessives. The four genes are as follows:—

(1) *D* — normal size plant dominant to *d* — dwarf
(2) *S* — smooth fruit " " *s* — pubescent fruit
(3) *O* — round fruit " " *o* — pear-shaped fruit
(4) *S* — simple inflorescence " " *s* — compound inflorescence.

Differences in fruiting time associated with the *Dd* region are about 8 days, with the *Pp* region 5 days, and the *Ss* region 4–8 days. There is no definite association for the *Oo* region. Interaction data shew that each earliness gene tends to reduce the effect of the others present.
The regions exert their effect on growth very early in the life cycle.
Tetraploids shew greater variability in fruiting time but the extra dose of earliness genes does not seem to produce earlier plants. J. G. H.

991. Humphrey, L. M. 635.64:575.127.2:576.312
A cytological and morphological analysis of tomato species.
Cytologia, Tokyo 1937 : **8** : 306–18.
A comparison of the cytology and micromorphology of *Lycopersicum esculentum*, *L. pimpinellifolium*, and their F_1 hybrid is given. The two species differ chiefly in size, the latter being smaller in every character. Meiosis in the hybrid was regular, though characterized by reduced chiasma frequency.
Some of the small-fruited plants collected from different parts of the world are shewn to be *L. pimpinellifolium*, others were merely small-fruited forms of *L. esculentum*. J. G. H.

992. 635.64–2.484–1.521.6:575.127.2
Alexander, L. J. 635.64 Globelle
A new tomato variety resistant to leaf mold.
Phytopathology 1938 : **28** : p. 1. (Abst.)
The new variety, Globelle, has been produced from a cross between the varieties Globe, *Lycopersicum esculentum* and Red Currant, *L. pimpinellifolium*, four back-crosses to *L. esculentum* having been made in the 14 generations since the original cross in 1930. Globelle produces pink fruits, as does Globe, but the quality is higher in the new variety.
The factor for resistance to leaf mould, Cf_{p1} appears to be linked to a semi-lethal factor and to small fruit size.

993. Singh, B. N., Chakravarti, S. C. and Kapoor, G. P. 635.648:575.127.2
An interspecific *Hibiscus* hybrid between *H. ficulneus* and *H. esculentus*.
J. Hered. 1938 : **29** : 37–41.
A description is given of the hybrid *H. esculentus* x *H. ficulneus*. Hybrid vigour was displayed in increased height and branching and in greater number of fruits, though the hybrid was sterile. The stem colour, epicalyx, fruit size and dehiscence and time of flowering of the hybrid were intermediate and it resembled *H. esculentus* in its compact stigma head. In other respects the hybrid resembled *H. ficulneus*.
The hybrid had two pairs of stipules compared to one pair in each parent.

994. 635.651:576.354.46:581.03
Straub, J. 635.651:576.356.52
Untersuchungen zur Physiologie der Meiosis VII. Die Abhängigkeit der Chiasmabildung bei *Vicia Faba* und *Campanula persicifolia* von äusseren Bedingungen. (**Investigations into the physiology of meiosis VII. The dependence of chiasma-formation in *V. Faba* und *C. persicifolia* on the external conditions**).
Z. Bot. 1937 : **32** : 225–68.
The effect of temperature and water supply on chiasma frequency was studied in *Vicia Faba* (little or no terminalization) and *Campanula persicifolia* (complete terminalization).
In the broad bean it was found that temperature was the important factor, restriction of water supply, within the experimental limits, having no effect on chiasma frequency. Reduction in temperature to 4° C. caused a slight fall followed by a rise to slightly above the normal chiasma frequency. Temperatures up to 34° C. caused a marked lowering of chiasma frequency and in one plant treated for two days at 34° C. complete asynapsis was found in some cells, together with striking irregularities in the course of meiosis.

An inflorescence of *Vicia Faba* was found with the haploid number of chromosomes undergoing mitosis in the pollen mother cells. The plant itself was diploid.
In *Campanula persicifolia* the water supply had much more effect on chiasma frequency (terminal chiasmata in this case) than had temperature, restriction of water causing a decrease. The chiasma frequency in the megaspore mother cell was lower and more variable than in the pollen mother cell.
Genotypic control of chiasma frequency was also noted. The long M-chromosome in the broad bean variety Breustedt had a chiasma frequency of 6·28, that of the variety Rastatt 5·68, the difference being significant.

995. Williams, L. F. and
Williams, G. S. 635.655:576.356.2:575.116.1
The use of prime types in linkage studies in the soybean.
Genetics 1938 : **23** : p. 176. (Abst.)
A cross between Hahto and Type 116, a strain descended from an irradiated seed, produced plants shewing approximately 50 per cent sterility in pollen and ovules. The F_2 and F_3 behaviour indicated that this was due to segmental interchange; the parents therefore represent different prime types. Semi-sterile plants can be quickly identified by their pods, many of which are one-seeded, and different types should therefore be useful in linkage studies. In the cross mentioned a factor *I* has been found to be linked with the translocation with 14 per cent crossing-over.

996. Lamprecht, H. 635.656:575.11
Genstudien an *Pisum sativum* I. Über den Effekt der Genpaare *Con-con* und *S-s*. (**Gene studies on *P. sativum* I. On the effect of the gene pairs *Con-con* and *S-s*).**
Hereditas, Lund 1936–37 : **22** : 336–60.
In most pea varieties with curved pods the ventral suture is concave outwards, the seeds being outside the arc; in the variety Pois sabre the ventral suture is convex outwards, with the seeds inside the arc. The author terms the latter type of pod convex. In a cross with a variety having straight pods, the convex type behaved as a simple recessive. This recessive gene is named *con*, from *convexus*.
Another recessive gene *s* causes a sticking together of peas in the pod. From the fancied resemblance of the structures thus produced to caterpillars this character is known as "chenille." It is variable in expression and deficiencies of chenille individuals are often observed. The author shews that this variability is due to the spacing of the peas in the pod. When they are densely packed they stick together, when loosely they often fail to do so. Thus in a plant with widely spaced peas the chenille character is expressed weakly or not at all.
These deficiencies in *ss* individuals cause apparent fluctuations in the linkage of *s* with W_2^b (waxy leaf). In three crosses of the author crossing-over percentages of 10·22, 10·13 and 28·8 were obtained while by previous workers as low as 0·27 has been recorded.
The variable expression of chenille gave evidence that there is a gene closely linked with *A* (coloured flowers) influencing the closeness of the seeds in the pod.

997. Lutkov, A. N. 635.656:575.243:537.531
(Reciprocal translocations and gene mutations in *Pisum sativum* induced by X-radiation of pollen).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 377–416.
Line D.S. 276, possessing the recessive genes *w, k, b, st, p*, was pollinated by D.S. 228, bearing the corresponding dominants, after subjecting the latter to X-ray irradiation in the young flower bud stage. The fertility of the flowers became progressively less as the dosage was increased from 300 *r* to 2,000 *r*, and doses of 2,500 *r* and over proved lethal. The 430 seedlings produced displayed great variation in habit, and differed sharply from the control plants produced by crossing the two lines without irradiation. Pollen abortion varying from 20 to 81 per cent was observed, especially in the higher dosages, the percentage set varying in proportion. In such plants chromosome associations indicating the existence of structural

interchanges were observed, such as rings of 4 chromosomes, sometimes resulting in an unequal distribution of chromosomes in the daughter cells. Pentads and hexads were observed in addition to tetrads. The somatic chromosome number was nevertheless 14 in all plants.
The progeny of eleven of these partially sterile plants segregated into sterile and normal in the ratio 1 : 1, indicating that the sterility was due to the ring formation. The same was observed in back-cross progenies, thirteen families shewing clear segregation for sterility and the sterile segregates again shewing ring formation at meiosis. The progeny of the other plants was fertile, shewing the sterility to have been due to other causes, such as deficiencies, etc. The fertile segregates had normal meiosis. Certain plants of the second generation proved to be trisomics with 2n = 15; one of these had unusually large bracts and was different in many respects from the normal, and quite self-sterile; at metaphase $7_{II} + 1_{I}$ or $6_{II} - 1_{III}$ were formed and various meiotic irregularities were detected; this type appeared again in the third generation. Another trisomic, less clearly distinguishable from the rest, was only 50 per cent sterile; it only rarely formed a trivalent and meiotic irregularities were not quite so pronounced. It produced a progeny of ten plants, of which eight had a somatic chromosome number of 14 and two had 15. A third trisomic was variegated and smaller in all its organs; it formed both univalents and trivalents at meiosis, had 53·5 per cent abortive pollen and was quite sterile. In the third generation from one of the partially sterile plants a tetrasomic plant with 2n = 16 also appeared; it had 90 per cent abortive pollen and was completely sterile.
The method of crossing, using the recessive form as maternal parent, permitted the detection of mutations in the F_1 generation. Thus certain plants bore green pods instead of purple, the gene P_1 having evidently mutated to p_1; this was confirmed in the F_2, where segregation was observed for all the other factors concerned, namely *W*, *K*, *B* and *St*, but all the plants bore green pods p_1. Other factorial mutations were observed in F_2—e.g. albino and other chlorophyll deficiencies; double flowers which were female sterile though forming normal pollen; and a fasciated form with flowers arranged in a terminal inflorescence in the form of a kind of umbel; this was the most frequent mutant of all. All these mutants proved to be single recessives; they appeared sometimes in the same families as the segmental interchanges and sometimes separately.

998. Barulina, H. 1. and Dombrovskaya, H. A. 635.658:576.16:575.1
(Genetic differentiation in geographical races. I. Lentils—*Lens esculenta* Moench.).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (7) : 277–338.
Cyclic crossings are being made between all the different geographical groups of lentil and the results so far obtained are communicated.
The first generation was in all cases normally fertile and no difference has been detected between the reciprocals. Heterosis was relatively frequent, the number of pods per plant being occasionally as much as four times the normal, heterosis being more frequent in crosses between not too widely separated forms. In one cross, between forms from Peru and Syria, the hybrid was as much as 18 days earlier than the parents.
Crosses between races of very different geographical origin often behaved more like interspecific crosses, sterility and various kinds of growth anomalies being apparent in the F_2 generation; the degree of sterility varied from a slight reduction in fertility to an entire absence of seeds. No meiotic or pollen irregularities were observed however in the sterile plants. In these wide crosses chlorophyll deficiencies were of frequent occurrence; also true breeding dwarfs resulting from a reduction in the length of the internodes, the leaves, flowers and pods being of normal size; and fasciated forms, with all the flowers crowded together on the upper part of the stem.
The majority of European forms have white flowers with blue veins, the Asiatic forms have purple flowers; white flowered forms, probably of mutant origin, have been found in India and Asia Minor. These two white flowered forms give also white when inter-crossed; on crossing the form from Asia Minor with the European forms, the blue veins are dominant and give monohybrid ratios in the F_2. Monohybrid segregation also occurred in crosses of the purple

Asiatic with the veined European and the pure white Indian forms. The pure white from Asia Minor gave dihybrid segregation with the purple forms, producing 9 purple : 3 veined : 4 pure white; a similar ratio occurred in crosses between the Indian pure white and the European veined forms, the F_1 of which was purple. It is thus assumed that two factors for flower colour exist, a basal factor *A* together with *B* for purple colour. The Indian white form is *aB* and the one from Asia Minor *ab*, the veined form being *Ab*.

Flower colour was inherited independently of the purple colour of the vegetative organs and the seeds but purple flower colour and spotted seeds were inseparably linked, both being apparently produced by the same gene *B*. This gene also proved to be linked with *V* for purple pods, with a cross-over of 18·1 per cent.

Purple and crimson pod colour was dominant to green, as was the presence of purple spots. On crossing crimson and purple the former was dominant in the early stages of pod development and the latter in the later stages of maturity; at any one stage monohybrid ratios were observed in F_2 but by following the whole period of development dihybrid segregation was disclosed, the two genes *V* for purple and *P* for crimson being independent; purple spots were conditioned by a third gene *D*.

Crosses between greyish-red seeded and green seeded forms gave dihybrid segregation in the ratio 12 : 3 : 1, with the appearance of a new intermediate group with pink seeds; the two genes concerned are named *S* for grey and *N* for pink. Black seed colour was only partially inherited and is thought to be caused by a chimaera. Spots are inherited independently of colour and are determined by the gene *B* for flower colour. Smoky flecks are produced on the seed by a still further recessive gene *c*.

Two genes for cotyledon colour were found, *R* and *Y*, which together give red cotyledons; one alone gives yellow and the double recessive is green. These are inherited independently of seed coat colour.

Monohybrid segregation occurred in crosses between forms with purple and green seedlings, the heterozygotes being intermediate. The factor pair concerned, *Ee*, was independent of other genes investigated.

Highly pubescent forms were dominant to less pubescent, the F_2 segregation shewing the presence of a number of factors.

Forms larger than either parent appeared in the first generation of certain crosses, owing to heterosis, and in the second generation of others owing to transgressive segregation; transgression also occurred in certain crosses in respect of flower size and seed size, of earliness and lateness and of disease resistance. In other crosses the parental types as regards quantitative characters were never recovered in the F_2, again indicating the presence of a large number of genes. Correlations have been observed between flower size and seed colour; races with large white flowers tend to have large light-coloured seeds.

It is pointed out that many of the above genes and their behaviour are parallel to those observed in other allied leguminous genera; and that the races from different geographical zones are genetically distinct, even when they are outwardly similar, as witnessed by the wide segregation and irregularities resulting from crosses between Abyssinian and Afghan forms; complete sterility between them is not found however and this is regarded as one of the early stages of specific differentiation. The races found in the primary centres of origin of cultivated plants such as Afghanistan and Abyssinia are characterized by a preponderance of dominant genes, as opposed to the predominantly recessive character of the races of the periphery of distribution such as Europe and America.

BOOK REVIEWS

HIGGINS, V. 001.4

The naming of plants.

Edward Arnold & Co., London 1937 : 3s. 6d. Pp. 103.

Any attempt to clarify the confusion of plant names is welcome and this plain exposition of the difficulties of the subject, taking into account both the efforts of the botanist to arrive at a true scientific conclusion and the trials of the gardener when offered the same plant under different names should foster the much needed co-operation between the practical man and the researcher. Certain general rules for the nomenclature of plants have been drawn up by International Congresses and by adherence to these, in spite of individual preferences and prejudices, the work of creating order out of chaos will be greatly facilitated.

There is no doubt that one of the main difficulties lies in the time taken for any change in nomenclature to reach the gardener and the suggested revision of the names of plants most commonly grown if published in a handy form would be of material assistance.

HOPPER, E. G. and
WILKINS, L. K. (Compilers) 016:63(73)

List of periodicals currently received in the Library of the United States Department of Agriculture, June 1, 1936.

Misc. Publ. U.S. Dep. Agric. 1936 : No. 245 : Pp. iv+ 337.

This publication of the United States Department of Agriculture supersedes the Catalogue of the Periodicals and other Serial Publications in the Library issued in 1901 (Library Bulletin 37), the List of Periodicals Currently Received in the Library issued in 1909 (Library Bulletin 75) and the List of Serials Currently Received in the Library of the United States Department of Agriculture, issued January, 1922 (Department Circular 187). The list includes titles of 3871 regular periodicals. Bulletins and Circulars of the United States Department of Agriculture or other United States Government Departments are not included, nor are publications received by the Weather Bureau Library, mimeographed publications, farm bureau and agricultural extension publications or general newspapers.

The titles are arranged both alphabetically and under subjects and a key to the subjects is also provided.

The Russian journals (covering over 3 pages) have been put in a separate group and classed under the transliterated title or its recognized translated form in French, German or English, (where such exists), or else under the place of publication; and as a further aid to consulting such periodicals cross-references from the first word of the title (or from the place of publication) to the Russian section have been inserted in the main alphabetical index, which comprises journals emanating from the main countries of the world with the exception of Russia.

The compilation and arrangement are in keeping with the high standard to be expected from the United States Department of Agriculture in the production of reference books of this nature. This publication should be invaluable in agricultural libraries and research or other institutes concerned with the distribution of technical information.

MADSEN-MYGDAL, T. 03:63

Landbrugets ordbog. (**Agricultural dictionary**).

Gyldendalske Boghandel, København 1937 : 3rd ed. Vol. 1 : Pp. 863. illus.

Volume I of the third edition of this admirable Danish encyclopaedia of agriculture has been published in 1937. In view of the growth and development of agricultural science and practice and the changes that have taken place in the economic situation in Denmark in the last 20 years, the new edition has been revised and amended throughout to bring it up to date.

The concise but adequate presentation of the material combined with the clear arrangement and the apt use of cross-references and illustrations reflects the qualities of sound practical

judgment, balance and clarity which so frequently characterize Scandinavian reference books of this kind.
It is intended for the practical agriculturist and the agricultural instructor in Denmark; but would certainly be of value in all agricultural institutes where foreigners or those acquainted with the Danish language are to be found.

RUBIO, D. and
SULLIVAN, M. C. 030:02
A glossary of technical library and allied terms in Spanish and English.
H. W. Wilson Co., New York City, U.S.A. 1936 : $1.25. Pp. 153.

This useful and from the point of view of its subject, rather unusual type of dictionary forms the first part of a glossary which is ultimately to include Portuguese as well as Spanish and English. The work which was originally suggested by the Inter-American Bibliographical and Library Association consists of two main sections, one devoted to the English-Spanish part of the dictionary and the other to Spanish-English. A third section comprises Latin, English and Spanish names of the most important publishing centres.
Bibliographers, historians, librarians, publishers and printers engaged in work involving the use or comprehension of foreign terms should find the glossary with its equivalents accompanied by concise definitions in English and Spanish extremely useful.
The arrangement is simple and clear, but since criticisms, advice and additions are invited for a second edition, one may perhaps suggest that when the Spanish and English glossaries are supplemented by the Portuguese a stronger binding should be used than the modest paper back at present provided.

MARZELL, H. 030.8:58(43)
Wörterbuch der deutschen Pflanzennamen. (**Dictionary of German plant names**).
S. Hirzel, Leipzig 1937 : RM. 5† : Pp. x + 143. 26 figs.

That the author of this dictionary of German plant names has devoted 35 years of his life to the collection and study of German plants and that he has also interested himself in the linguistic aspect of plant names are impressive qualifications for one who has undertaken the gargantuan task (1) of compiling, describing and defining and interpreting from the botanical and linguistic standpoints, about 80,000 names of plants indigenous to all German speaking localities and also foreign plants for which German names are used and (2) of comparing these names with those of other European tongues.
Courage and tenacity in the face of difficulties in carrying out such a task single-handed and under post-war conditions were rewarded by the co-operation of the Prussian Academy of Sciences and the appointment of the botanist Wilhelm Weissmann as collaborator. The vast amount of data required has now been collected and its arrangement has been begun.
Part I includes in addition to the dictionary proper, the introduction, lists of signs and abbreviations, etc. and a bibliography of sources consulted (extending over nearly 50 pages) with critical notes on their value.
The actual dictionary is arranged alphabetically under the Latin scientific names accompanied by their common German equivalent, illustrations (where possible), with notes on the etymological relationships between different local varieties of the names, and on the locality, habitat and uses and, in some cases on botanical features of the particular plant.
As far as can be estimated at the present juncture the dictionary is expected to run to 20–25 parts and it is hoped that about 3 parts may be published annually. Even from the first part however it is evident that a work of erudition is in the making, of value to specialists in search of botanical or linguistic information on the known or obscure plant names of Germany. One can only regret that the demand for such a highly specialized work of reference must necessarily be limited.

† 25 per cent reduction outside Germany.

KOSTITZIN, V. A. 519:57

Biologie mathématique. **(Mathematical biology).**

Armand Colin, Paris 1937 : Collection, No. 200 : Bound 15.50 fr., unbound 13 fr. Pp. 223 + 12. 16 figs.

It is doubtful if any book of this character exists in the English language. Its purpose is to describe the mathematics of biology, with particular reference to growth laws, and is an expositions of the work of Volterra, Pearl, Lotka and others. No doubt the more mathematically minded of the biologists of this country will be grateful for the opportunity of having a great deal of this somewhat diffused knowledge made available to them within the compass of some 200 pages. The author begins by introducing certain mathematical concepts, including frequency curves and correlation, and a short exposition on the solution of differential equations. He then embarks on his study of the growth of populations, describing the logistic law, and its applications and generalization. The relations between species are gone into, and in particular the biological laws of Volterra are described. Studies on the growth of organisms, embryonic and post-embryonic, lead up to a final chapter on evolution. The book is not just a mathematical study of biological problems, rather it is an exposition of some biological problems which are susceptible of being treated by mathematical methods. Thus the interest is biological throughout, even although there may be only a limited number of biologists who are able to read the book with profit. To such it will be most informative and helpful. J. W.

SNEDECOR, G. W. 519.24

Statistical methods applied to experiments in agriculture and biology.

Collegiate Press, Inc., Ames, Iowa, U.S.A. 1937 : 17s. 0d. Pp. xiii + 341.

This book is written on a somewhat original plan, in the sense that tests of significance as applied to experimental data are introduced within the first few pages, instead of, as often happens, being relegated to much later on as a difficult idea for the student to grasp. The method is instructive, however, particularly as the problem is always introduced by means of an explanatory example, and the idea of the random sampling distribution of a statistic is conveyed by a process of actual experimental sampling. The needs of the non-mathematical worker have been kept in mind throughout, and while this necessitates the adoption of a somewhat didactical tone, in that the student is just told what calculations to perform and where to look up the necessary tables for testing significance, at least there is little excuse for the student to go wrong, and the manifold nature of the examples leads to most of the cases that are likely to arise in practice being dealt with.

Experiments such as those just alluded to lead up to the comparison of percentages and mean values, and to consideration of experiments designed to compare two groups. Linear regression and correlation follow, and the author then goes on to consider experiments involving more than two groups, leading to the large and complex branch of study which involves the analysis of variance and covariance, with its numerous ramifications. Multiple and curvilinear regression is dealt with, and the book concludes by introducing the student to the idea of individual degrees of freedom, with the related questions of orthogonality and the design and analysis of factorial experiments.

The book may be recommended as a comprehensive treatise on statistical and experimental methodology for the practising biologist, with a strong bias towards agricultural experimentation. J. W.

MUCKERMANN, H. 575.1

Vererbung und Entwicklung. **(Inheritance and development).**

Ferd. Dümmlers, Berlin and Bonn 1937 : RM. 5.85.† Pp. xi + 213. 94 illus.

After a short introductory chapter on the historical aspects of the subject covering the discovery of the cell, theories of evolution and Mendel's work on the laws of inheritance; the modern basis of genetics, the biology of cell division, is simply expounded. This leads on to an explanation of some of the more complex problems of inheritance and finally to the application of the principles of genetics to inheritance in man to which about a third of the

work is devoted. The book is illustrated by good photographs and diagrams and is intended for the layman who wishes to understand something of the scientific principles underlying genetics and eugenics.

575.1:061(73)

Records of the Genetics Society of America.

Published by the Secretary-Treasurer, 1937 : No. 6 : 1–42, 139–77.

This account of the activities of the Genetics Society of America for 1936–37 contains *inter alia* a list of names and addresses of members and abstracts of papers presented at the Fifth Summer Meeting and at the Sixth Annual Meeting, held at Woods Hole and Indianapolis respectively. These are reprinted from "Genetics", Volume 23, and those of interest to plant breeders are reviewed in this issue of "Plant Breeding Abstracts".

Beurlen, K. 576.12

Die stammesgeschichtlichen Grundlagen der Abstammungslehre. (**The phylogenetical basis of evolution**).

Gustav Fischer, Jena 1937 : Bound RM. 10.50, unbound RM. 9.† Pp. viii + 264.

The problems both biological and philosophical of phylogenetical development and evolution are fully treated, especially from the paleontological point of view.

Beginning with the history of the development of the conception of evolution the author goes on to discuss the self-determination of the course of phylogeny, the formal tendencies in evolution, phyletic form and environment, and the origin of types.

The data are taken from the animal kingdom. Each section has its own bibliography.

Went, F. W. and
Thimann, K. V. 577.17

Phytohormones.

MacMillan Company, New York 1937 : $4.00. Pp. xi + 294. 62 figs.

Even since the appearance of Boysen Jensen's admirable book on plant hormones (see "Plant Breeding Abstracts", Vol. VII, p. 442) new lines of development in this rapidly extending field have appeared and some of these are treated in the work before us, which includes references to literature appearing up to the end of 1936; indeed 77 of the works referred to in the bibliography bear the date 1936, a further indication of the rate at which the subject is extending. The work is limited to the consideration of the substances affecting the growth of the higher plants, thus the auxins proper.

The growth of the hormone conception as applied to plants is traced by reference to the now classical experiments, and the methods of measuring auxins, their action on the growth of stems and roots, their transport in the plant, their chemical composition and their role in tropisms are among the various aspects of the subject treated at some length. Of rather more particular interest to plant breeders will be the sections on root formation—e.g. in cuttings—and on cell division as influenced by auxins; thus cambial activity, callus formation and the associated stem swelling and root formation are stimulated by auxins, as are certain other phenomena such as flower bud development.

The present volume, though not so fully documented as the book by Boysen Jensen, is for that reason perhaps more readable and affords an admirable general outline of the subject, with full indications of sources of further information.

Barton Wright, E. C. 581.1

General plant physiology.

Williams and Norgate, Ltd., London 1937 : 15s. 0d. Pp. 539. 44 figs.

This new textbook of plant physiology is divided into three parts.

Part I deals with the general physiology of the cell, with chapters on the scope of physiology, colloids and protoplasm, osmosis, permeability, transpiration and the ascent of sap.

Part II is concerned with metabolism, with chapters on catalysis and enzymes, photosynthesis, the fats, nitrogen metabolism, ash, transport of solutes and respiration.

The third part is headed: growth, reproduction and irritability. The chapter on reproduction has sections on vernalization and photo-periodism and also treats of certain genetical topics such as sex, heterothallism, sterility and hybrid vigour. The section on sex contains the remarkable statement that "in the Bryophyte Sphaerocarpus the xx and xy mechanism also appears to be present" and in general the treatment of these genetical topics leaves much to be desired. With regard to the main body of the book, the foreword by Sir F. Gowland Hopkins gives a warm commendation.

The book concludes with an appendix on the conception of pH, a bibliography of general works and author and subject indexes.

YATES, F. 631.421

The design and analysis of factorial experiments.

Tech. Commun. Bur. Soil Sci., Harpenden 1937 : No. 35 : Pp. 96. 91 tables. Price 5s. 0d.

The Imperial Bureau of Soil Science, by the publication in 1930 of its Technical Communication No. 10, did a great deal to popularize among agriculturists and others the methods of field experimentation associated with Rothamsted and the name of R. A. Fisher. Continued development of such methods at Rothamsted has led to the appearance of the present Communication, far more bulky (and incidentally expensive) than its predecessor, and which is designed to convince experimenters of the need for employing factorial designs. Simple factorial designs have been in use for a long time, and it is doubtful whether anything more elaborate than the very simplest of such designs is in use to-day except at a limited number of experimental centres. The more complex designs which are described are due to the author, and while they have a good deal to recommend them in most cases, it may be doubted whether the popularization aimed at will be achieved by the introduction of so much material that requires hard thinking and considerable concentration of effort, within the covers of a single pamphlet. Plant breeders will find the most interesting section to be that dealing with varietal trials, wherein are described methods for dealing simultaneously with a large number of varieties. This is a real problem to the plant breeder, particularly at the early stages of breeding work, and he has not so far had much help from the statistician, whose methods have been most effective when the number of varieties was strictly limited. The new quasi-factorial designs are commended to his attention.

The author is to be thanked for the expenditure of so much painstaking effort in collecting his material, and the Soil Bureau for financing the publication in the interests of agricultural experimentation.

J. W.

632

HEALD, F. D. 633–2–1.521.6:575

Introduction to plant pathology.

McGraw-Hill Publishing Company, Ltd., London 1937 : 24s. 0d. Pp. xi + 579. 200 figs.

The book is to some extent based on the same author's "Manual of Plant Diseases", but is not merely an abridgement of the more complete manual, as it involves much added material and an entirely different order of presentation.

There are six sections, the first being introductory and general. The second deals with parasitic diseases due to fungi, bacteria, parasitic plants and nematodes; many examples are given, including the classical examples and others. Section III is devoted to virus diseases, consisting of a chapter on their general aspects and a chapter of examples. The fourth section gives an account of non-parasitic diseases, covering soil conditions, improper air, temperature and light relations, diseases due to manufacturing and industrial processes and injury from control practices such as sprays and disinfectants. In the fifth section measures of control in general are considered; this section includes a short chapter on seed selection and breeding disease resistant varieties. The last section is concerned with experimental methods and contains three chapters, on methods of studying parasitic diseases, virus diseases and non-parasitic diseases respectively. An index of some 30 pages concludes the work. There is no general bibliography but references which have come to the author's notice since 1932 are

given at the end of each chapter. For earlier references the reader is referred to the "Manual of Plant Diseases", the last edition of which appeared in 1932.
It seems likely that this book will render useful service in the teaching of plant pathology and its numerous illustrations will be helpful in this respect.

SMITH, K. 632.8
A textbook of plant virus diseases.
J. & A. Churchill, Ltd., London 1937 : 21s. 0d. Pp. x + 615 + 16. 101 illus.

The greater part of Dr. Smith's new book, covering 450 pages, is taken up with a systematic account of the different plant viruses now known. The system adopted is based on that suggested by Johnson, from which it differs chiefly in using the Latin generic name of the plant instead of the common name. In this system the viruses are classified according to their first named or most important host. Different viruses associated with the same plant are given numbers while strains of the same virus are distinguished by letters. For example, the well-known mosaic of tobacco becomes *Nicotiana Virus* 1, of which strains A to D are recognized by the author.
The viruses are dealt with in order of their plant hosts, beginning with *Ranunculaceae* and ending with *Gramineae*. Under each virus information is given on its properties, mode of transmission and so on and then the diseases it causes in its different hosts are described. For most of the economically important diseases measures of control are indicated, in which connexion the emphasis placed on resistant varieties is of interest to the plant breeder.
The account of the viruses is followed by a chapter on the insects and one arachnid, *Eriophyes ribis*, concerned in the transmission of virus diseases. The final chapter deals briefly with some suspected virus diseases requiring further investigation.
An appendix lists the viruses in alphabetical order of their host genera, giving the symptoms and the name of the virus, with references to the pages on which the further details are to be found. This should be useful in diagnosing suspected virus diseases. Two viruses inadvertently omitted from the main part of the book are treated in an addendum and the book ends with subject and author indexes. Extensive references to the literature are given at the end of each chapter.
The work is packed with information and can be confidently recommended. It does not replace but rather complements the same author's "Recent Advances in the Study of Plant Diseases" (Cf. "Plant Breeding Abstracts", Vol. IV, p. 356).

MORSTATT, H. 623.9:016
Bibliographie der Pflanzenschutz-literatur. Das Jahr 1936. (**Bibliography of the literature on plant protection for the year 1936**).
Paul Parey, Berlin 1937 : Pp. iv + 392.

This volume continues the good work of its predecessors (see "Plant Breeding Abstracts", Vol. VII, p. 346) in collecting the literature on diseases and pests, on the plants that suffer damage, on the measures taken for their protection, together with legislation and statistics on the extent and occurrence of damages due to pests and diseases.

633:551.566:016
Bibliographie d'agriculture tropicale 1936. (**Bibliography of tropical agriculture** 1936).
Inst. Int. Agric. Rome 1937 : Pp. vii + 326.

The sixth volume of this valuable bibliography (cf. "Plant Breeding Abstracts", Vol. VII, p. 259) shews by a further increase in size that the aim of completeness is still being pursued. When publications of the last year have not been received in time, the abstracts are included in the next volume.
It is to be regretted that it has been impossible to obtain access to the Dutch Archief voor de Rubbercultuur, de Koffiecultuur and de Theecultuur.

ROEMER, T.,
FUCHS, W. H. and
ISENBECK, K. 633–2–1.521.6:575

Die Züchtung resistenter Rassen der Kulturpflanzen. (**The breeding of resistant races of economic plants**).

Kühn-Arch. 1938 : **45** : Pp. 427. 41 illus. Price Bound RM. 13.40, Unbound RM. 12.† (Published by Paul Parey, Berlin).

This volume 45 of the Kühn-Archiv appears as a monograph on the breeding of disease-resistant plants and is appropriately dedicated to Julius Kühn to mark the seventy-fifth anniversary of his appointment. The first part of the work is devoted to a consideration of the general aspects of the problem; the importance of breeding resistant varieties, in most cases the surest means of combating the disease and in some the only method; the biological aspects of breeding for resistance; the means by which the plant achieves resistance; the inheritance of resistance and the carrying-out of breeding for resistance.

The second part is occupied with the specific diseases and deals in each case, where possible, with the biology of the disease, resistance, infection, physiological specialization, inheritance and breeding. The following diseases are studied: *Synchytrium, Phytophthora, Actinomyces, Plasmopara, Uncinula, Venturia, Colletotrichum, Phytomonas, Erysiphe, Helminthosporium, Puccinia* spp., *Tilletia* and *Ustilago* spp., *Plasmodiophora, Sclerotinia*, the fungi causing foot-rot, *Fusarium lini* and a number of animal and insect pests.

The wide range of literature reviewed and the clear arrangement of the data recorded as well as the convenience of so much information on all the important diseases of the crop plant of temperate climates in one volume make this a most valuable contribution to the work of plant breeders and agriculturalists in the production of resistant varieties.

Each section has its own bibliography, the illustrations and diagrams are good and clear but there is no index.

ANTROPOV, V. I.,
ANTROPOV, V. F., 633.13
MORDVINKINA, A. I., and 633.14
ORLOV, A. A. 633.16

(**Flora of cultivated plants. II. Cereals. Rye, barley, oats**).

Published by the State Agricultural Publishing Company, Moscow and Leningrad 1936 : 12 roubles, 75 kopeks : Pp. viii + 447. 224 illus.

The second volume of this admirable series of monographs on crop plants and their species and varieties follows the lines of the first volume devoted to wheats (see "Plant Breeding Abstracts", Vol. VII, p. 121). For each crop in turn the geographical distribution of the genus and forms, their origin and variation are dealt with by reference to the literature before embarking on a full study of the systematics of the genus and its component species, subspecies, varieties and forms. The systematic characters include both morphological and biological features and are excellently illustrated. As before the varieties are described and illustrated and keys for their determination are provided. Tables are given shewing the occurrence of all varieties in the different countries of the world and a number of different ecological types associated with different regions are established. Each section terminates with a full review of the relevant literature.

The Russian botanists are to be congratulated both on the accumulation of such a vast store of knowledge of our cultivated plants, hitherto unrivalled in the history of plant breeding, and on the publication of it in such an exhaustive form.

WHYTE, R. O. (Editor). 633.2/3

Report of the Fourth International Grassland Congress, Great Britain, July 8 to 23, 1937.

Published at Aberystwyth, Great Britain, December 1937 : 40s. 0d. Pp. xxxiv + 486. illus.

The Report contains the full texts of all papers delivered to the Congress at Aberystwyth on July 15, 16 and 17, 1937. After the thirteen plenary papers, the remaining papers are divided

into the six sections, dealing with the following: one—grassland ecology, including range management; two—seeds mixtures; three—plant breeding, genetics and seed production; four—manures and fertilizers, soil aspects of grassland; five—nutritive value of pastures, fodder conservation and six—pastures, management, yield and economics. The languages used are English and German and every paper has a summary in both languages.
Lists of members and officials are given.
The following papers on plant breeding appear:—

Cardon, P. V.	Plant breeding in relation to pasture improvement. Pp. 31–39.
Sylvén, N.	Die Bedeutung der Oekotypen-Bildung für die Weide- und Wiesenpflanzenzüchtung. (Importance of ecotype formation for the breeding of herbage plants). Pp. 40–45.
Jenkin, T. J.	Some aspects of strain-building in the herbage grasses. Pp. 54–60.
Miln, T. E.	The farmer, the seedsman and pedigree grasses. Pp. 61–66.
Valle, O.	Die Züchtung der Grünlandspflanzen. (The breeding of grassland plants). Pp. 252–59.
Adams, A. B.	Western Australian strains of *Trifolium subterraneum.* Pp. 260–63.
Săulescu, N.	Beiträge zur Gräsezüchtung. (Contributions to the breeding of grasses). Pp. 264–69.

Section 3 begins with the following paper on genetics:—

Williams, R. D.	Genetics of red clover and its bearing on practical breeding. Pp. 238–51.

A summary of this paper will appear in the next number of "Plant Breeding Abstracts" (Vol. VIII, No. 4).

Kharyuzova, E. D.,
Kordon, R. J. and
Smolyaninova, L. A. 634.5
(Flora of cultivated plants. XVII. Nuts).
Published by the State Agricultural Publishing Company, Moscow and Leningrad 1936 : 8 roubles, 50 kopeks : Pp. viii + 354. 62 illus.

The volume of the cultivated Flora of the U.S.S.R. devoted to nuts begins with the pines. Next come walnuts, pecans, filberts, chestnuts and the volume is completed by the genera *Macadamia* and *Pistacia.* The volume is similar in form and scope to the others in the series and is an exhaustive and authoritative reference work on the genera concerned.

Bologovskaya, R. P.,
Katinskaya, J. K.,
Pavlova, N. M. and
Rozanova, M. A. 634.7
(Flora of cultivated plants. XVI. Small fruits).
Published by the State Agricultural Publishing Company, Moscow and Leningrad 1936 : 7 roubles, 25 kopeks : Pp. viii + 285. 113 illus.

The volume of this Flora devoted to small bush fruits includes sections on *Berberis* and *Actinidia* as well as currants, gooseberries, strawberries, *Rubus* and *Vaccinium* and allied genera. The material is arranged on the lines made familiar in the earlier volumes, and includes descriptions of a number of hybrid species. The volume is well documented, indexed and illustrated and is a worthy successor to the foregoing numbers.

635.65
633.3

Basilevskaya, N. A. *et al.*
(Flora of cultivated plants. IV. Grain leguminosae).
Published by the State Agricultural Publishing Company, Moscow and Leningrad 1937 : 14 roubles, 60 kopeks : Pp. xi + 680. 266 illus. 6 coloured illus.

In the fourth volume of this Flora the leguminous crop plants are dealt with on the lines adopted for cereals in the earlier volumes. Starting with a general account of the family *Papilionaceae* and its tribes, the main leguminous genera are treated in turn, each by the recognized expert. Thus *Cicer, Vicia, Lens, Lathyrus, Pisum, Glycine, Stizolobium, Canavalia, Cajanus, Phaseolus, Vigna* and *Dolichos* are dealt with in succession, each section closing with a list of the appropriate literature.

The standard associated with the earlier volumes of the Flora is well maintained, including some excellent coloured illustrations of flower and seed coloration.

635.655(43)

Dieckmann, A.
Die deutsche Sojabohne. **(The German soja bean).**
Reichsnährstand, Berlin 1936 : RM. 1.20. † Pp. 59. illus.

In this illustrated booklet the importance of the soja bean as a source of protein and fat for Germany is discussed and the cultivation and uses of the plant in Germany are described. Breeding work is expected to effect further improvements.

NEW JOURNAL

Erfelijkheid in Praktijk. **(Inheritance—Applied).**

In view of the rapid and extensive development of genetical theory and its applications in plant and animal breeding and eugenics in recent years the Dutch Genetics Association decided in 1936 to issue the journal "Erfelijkheid in Praktijk" (Inheritance—Applied), which is now the recognized organ of the Association and replaces the numerous occasional pamphlets and other printed communications of an informative nature which used to be issued from time to time to members of the Association.

The main objects of the journal are to create and maintain contacts between research workers and other persons interested in all the different branches and specialized fields of biological science bearing on heredity and to promote knowledge of discoveries and results obtained in the field of genetical science and, where desirable, their application in practical affairs.

In addition to this co-ordination and dissemination of knowledge, it is hoped that the Association may exercise its organizing functions through the journal which contains, in addition to annual and other reports and proceedings of the Association, also notes and observations on a wide variety of subjects with references to sources of material for study. By such means it is hoped to arouse mutual interest among investigators and to stimulate the exchange of views. Neither scientific reports and papers nor highly specialized information only of interest to the specialist in a particular field will, however, be included in the journal.

Members are invited to contribute to the journal which is obtainable by membership and in certain circumstances by non-members (individuals or institutions) on payment of a subscription to the Association.

The journal is at present issued about once every two months, but the intention is to make it a regular monthly publication.

The Association is to be congratulated on its enterprise which, if a satisfactory response is forthcoming from members of the Association and the public, should lead to the realization of the desired co-ordination of theory with practice in various spheres of human activity.

Articles of interest to plant breeders and geneticists that have appeared during 1936 and 1937 are reviewed in the current issue of "Plant Breeding Abstracts". (Published by Nederlandsche Genetische Vereeniging, Soesterberg, Holland. Price 3 guilders a year).

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